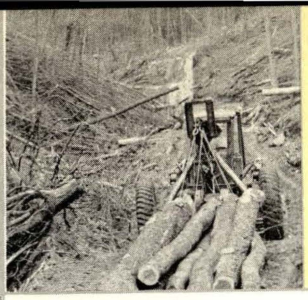

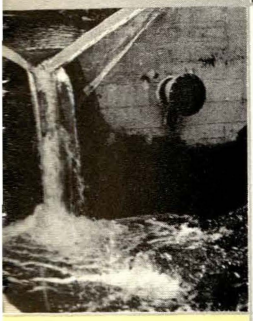

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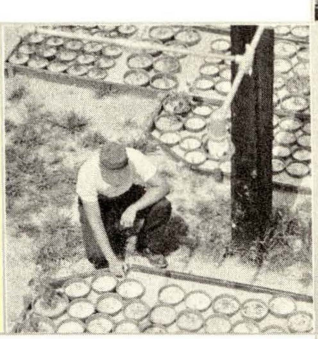
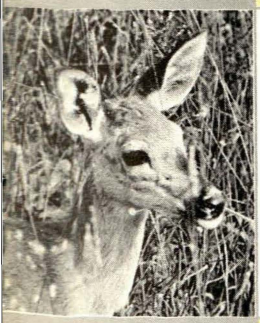
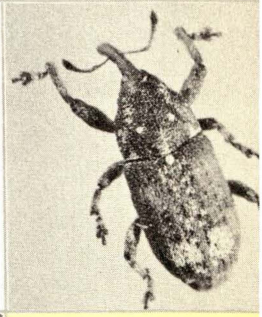
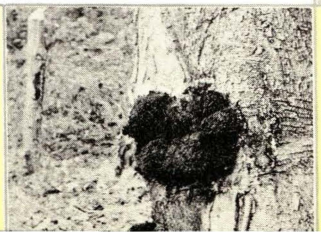




Northeastern Forest Experiment Station





FOREST SERVICE • U.S. DEPARTMENT OF AGRICULTURE • UPPER DARBY, PA.

1960 Annual Report

Northeastern Forest Experiment Station

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NORTHEASTERN FOREST EXPERIMENT STATION • • 1961
RALPH W. MARQUIS, DIRECTOR

In General...

EVERY so often we take the privilege--and run the risk--of departing from the customary format and contents of our Annual Report. Our report for the year 1953 gave a more than usually detailed account of our activities in timber and watershed management research at the individual field units. Our report for 1955 concentrated on research related to forest insects.

This year, inspired by another hurricane, a change in administration, and some unusually severe pre-winter storms, we risk it again. This report is intended as an introduction for our new readers and as a review for our established readers. Its purpose is to provide a brief resumé of the programs of the different functional divisions, and to show pictorially some of the work we are engaged in, results achieved, and fields that need scientific exploration. This is supplemented by an expanded annotation of publications issued during the year.

There were several events of more than routine interest during the year.

- The Northeastern Forest Research Advisory Council met at Bar Harbor, Maine, in June. Highlights were a field trip to the Penobscot Experimental Forest and a lively session at which members and guests looked ahead 40 years to consider possible changes that might affect forestry research needs.

- The Forest Products Laboratory observed its 50th Anniversary at Madison, Wisconsin.

- Four members of the Station staff attended the Fifth World Forestry Congress in Seattle.

- The Station was host to the Forestry Research Advisory Committee of the Department of Agriculture. The group toured by bus from Bangor, Maine, to Paul Smiths, New York; and the Committee conducted its formal meeting at Paul Smiths.

Forest Management and Fire Research

Our Division of Forest Management and Fire Research conducts studies at eight research centers and--with various cooperators--throughout the 12 states of the Northeast. This research includes eight major types of studies.

Timber management is important in our program. Large-scale tests to compare timber-management practices are under way at several of our research centers: in spruce-fir at Bangor, Me.; in northern hardwoods at Laconia, N.H.; and in Appalachian hardwoods at Elkins, W. Va. Most of our other centers have case-history studies on the management of forest stands. All but two of our centers have studies on small woodlot management.

Our genetics work is centered at the Morris Arboretum of the University of Pennsylvania in Chestnut Hill, Pa. Here most of our work in improvement of northern hardwoods and conifers is conducted through a program of selection, breeding, and testing by outplanting. Additional genetics research is conducted at Burlington, Vt., on the improvement of sap quality and sugar yield of sugar maple. Outplantings, progeny tests, and seed-source studies are located at all of the other eight centers.

Physiological investigations are being carried on at Laurel, Md.; these include studies of nutrient requirements and interrelationships between photoperiod and nutrition of pine seedlings. Our Laconia center is studying the effect of light on hardwood regeneration, and our Burlington center has physiology studies on the flowering and propagation of sugar maple.

Three of our research centers are participating in studies of soil-site problems in hardwood stands; they are the Elkins, Burlington, and New Lisbon centers. Still another soil-site study--in white pine stands in New England--is being conducted from Upper Darby.

In stand improvement, natural regeneration, and seeding and planting, all of our centers are participating in studies--either in conjunction with compartment studies or as special studies. Some of the more recent special studies started in these fields are tests of silvicides at Alfred,

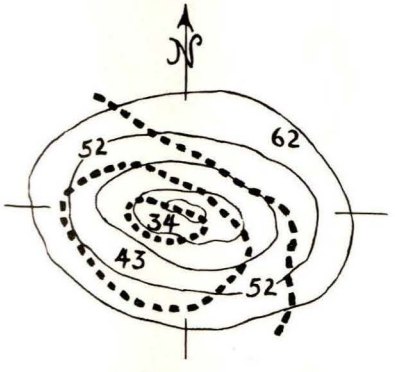
Me., Paul Smiths, N.Y., New Lisbon, and Elkins; regeneration of white birch at Bangor, Burlington, and Laconia; and revegetation of strip-mine banks at Warren, Pa.

All of our centers except the one at Burlington are participating in growth and yield studies in conjunction with compartment or case-history studies; the centers at Bangor, Laconia, and Elkins are also conducting special growth studies on a plot or individual-tree basis.

The most important fields of work in forest management for which there are pressing needs for more intensive or new research include timber-wildlife relations; growth and quality increment as related to environment and management; soil-site investigations; the management of softwood plantations; and nursery research on nutrition, quality of planting stock, and use of chemicals.

A one-man fire-research program was begun by the Station about 4 years ago, when it was realized that some basic research and most of the applied fire research must be done locally. So far three problem analyses have been or are being developed, and research has been started on prescribed burning, rate of spread, and strength of initial suppression attack. Other major problems include fire-damage appraisals, causes of fires, people responsible for causing fires, organization of fire-suppression efforts, forest fuels, and fire-danger-meter adaptations.

THE QUESTION OF SITE



Site-quality map of a mountain. Solid lines are contour intervals from a topographic map. The dashed lines delineate site classes, in cubic feet of mean annual growth per acre.

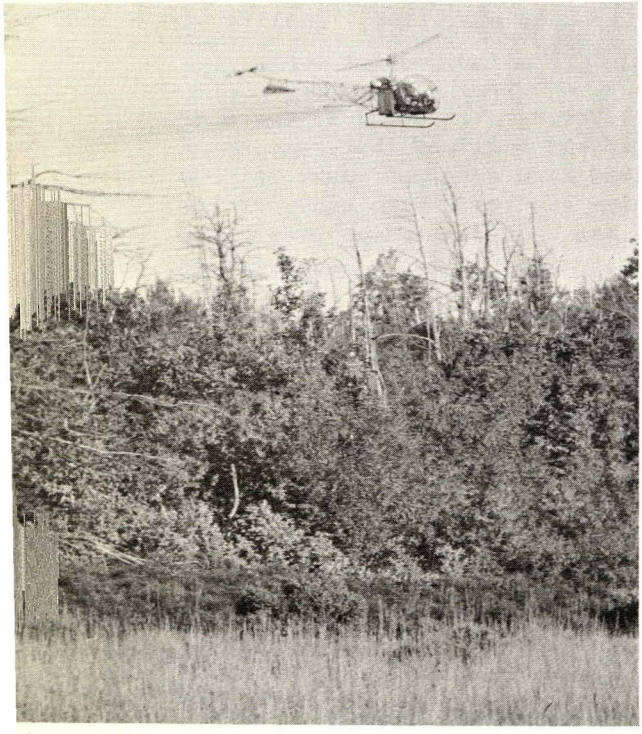
For most efficient forest management, each unit of land should be used according to its productive capacity. To that end we are studying site to identify the characteristics of topography and soil that can be used to estimate, classify, and map different site-productivity classes. This is being done in both softwood and hardwood forests.

For example, in West Virginia the rugged, broken

terrain presents great--and often abrupt--differences in site quality within short distances. But now we have learned how to map site productivity from soil depth, aspect, position on slope, and steepness of slope. Studies of this kind are being extended to other timber-producing areas and forest types.

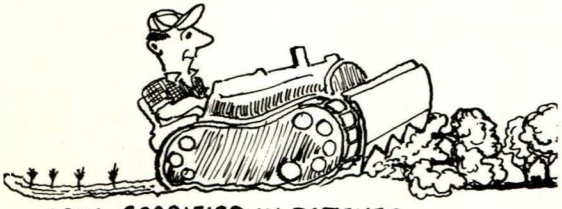
CONVERTING POOR GROWTH TO GOOD

In areas degenerated by fire, there is a problem in establishing desirable tree species.

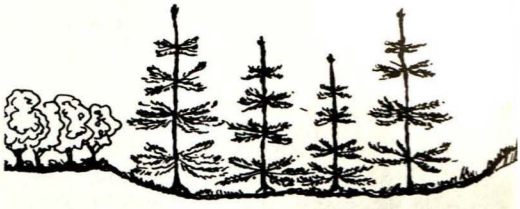


← In Maine, aerial spraying to kill off the competing hardwoods and release the pines has proved successful (left).

In the Pocono Mountains of Pennsylvania, rootrake and bulldozer have been tried to prepare sites for planting (see sketch below). Now we are studying large-scale control of scrub oak on such areas by means of silvicides applied by a tractor-mounted mistblower. This treatment is followed by direct seeding of pines. ↓



AREA SCARIFIED IN PATCHES AND PLANTED WITH PINE SEEDLINGS....



AND....SEVERAL YEARS LATER

PROBLEMS IN REGENERATING HARDWOODS

Natural regeneration of paper birch is hard to bring about. Best germination occurs where the seedbed has been disturbed so as to expose mineral soil. In Maine these seedlings (right) are the result of seed germinating on an area disturbed in logging. →

Controlled burning and disking (below) are being tried in attempts to improve natural regeneration. ↓

Although 1-year-old black cherry reproduction in northern Pennsylvania becomes established readily (left), like paper birch, survival is the problem. The same plot 7 years later (right) shows how other species have crowded out the cherry. Early overhead release, cleanings, and clear-cut strips and patches are being tried to favor the cherry.

DAMAGE BY WILDLIFE AGGRAVATES FOREST REGENERATION PROBLEMS

Forest regeneration is retarded, deformed, or even completely destroyed by deer herds that exceed the carrying capacity of the range.

← In Pennsylvania, the deer exclosure shown at left demonstrates dramatically the difference between the open range and the area protected behind the deer-proof fence, where young softwoods have had a chance to grow.

The photo below shows the same effect obtained with young hardwoods. ↓

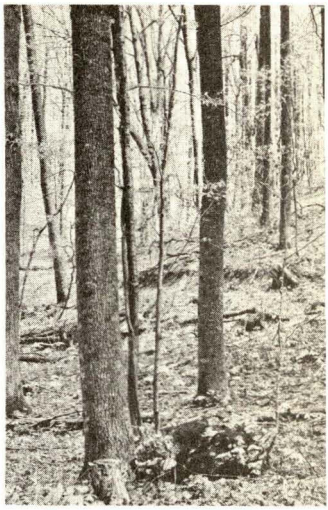
To find out how to manage both timber and deer on the same area, research is developing methods for measuring carrying capacity and for creating balanced conditions.

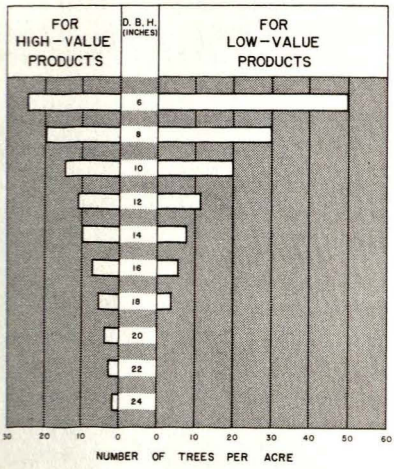
← Desirable species seldom survive repeated browsing by deer. This 14-year-old white pine, little larger than a pencil, never had a chance.

STAND-GROWTH RELATIONSHIPS

As forest management increases in intensity and extent, knowledge of stand-growth relationships becomes more and more important.

← Research has shown us how to increase the low growth rates of understocked, low-quality, unmanaged forests (left) by extensive management that reduces mortality and improves stocking and quality (right). →

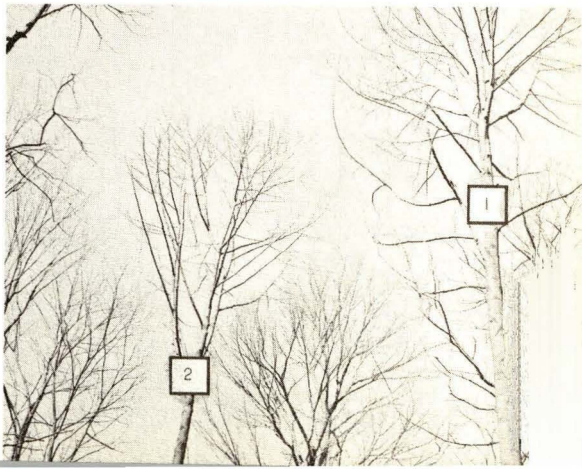


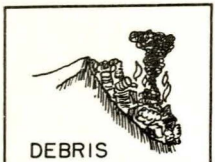


...But the problem is: how should this better stocking be distributed--both within and among stands--to best serve management objectives:

← Two stand-structure hypotheses for northern hardwoods, and for different product objectives, are illustrated at left. Many variations of these hypotheses will have to be investigated. And new research techniques are badly needed.

Individual-tree growth relationships are also being studied to provide the forester with accurate and objective means of estimating tree-vigor classes and quality increment potential. →





DEBRIS BURNING 27%

SMOKING 25%

UNKNOWN 16%

INCENDIARY 12%

MISCELLANEOUS 11%

RAILROADS 4%

CAMP FIRES 3%

LUMBERING 1%

LIGHTNING 1%

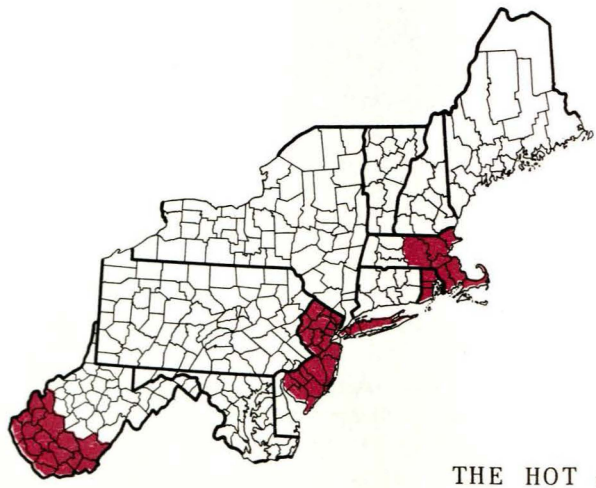
MANY OF OUR FIRE PROBLEMS ARE PEOPLE PROBLEMS

More than half of the forest fires in the Northeast are started by debris burners and smokers; and arsonists add another 12 percent.

More than 40 percent of the forest fires in this region start during the 24 days in the year when the burning index stands at 40 or higher. One answer to this is a fire-suppression organization that is efficient, large enough, and flexible enough to cope with short periods of high danger. This calls for continued research into organization, disposition of men and equipment, and development of effective methods and equipment.

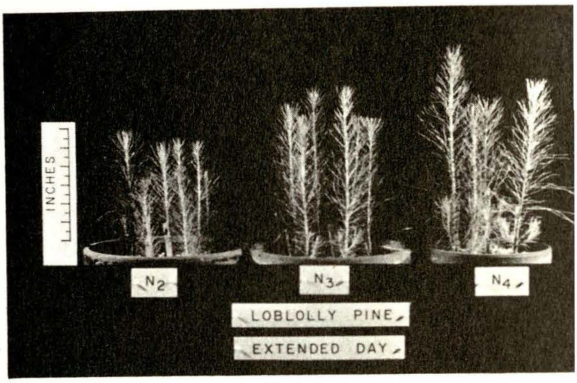
There are three distinct hot spots in the Northeast. Here occur half of all the fires; here is three-fourths of the area burned. Special research on causes of fires, people responsible for causing fires, fuel types, and fire danger systems is needed in these areas where, under certain conditions, large fires occasionally occur.

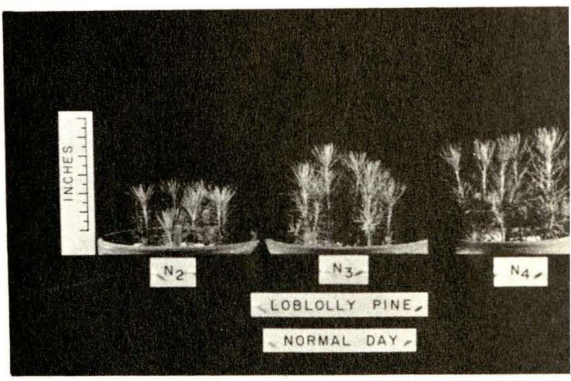
Among the other aspects of fire that need special attention in the Northeast are rate of spread and size of suppression force as related to fuel types and to various facets of the fire danger system itself.



THE HOT SPOTS

BASIC PHYSIOLOGY RESEARCH IN LIGHT AND NUTRITION



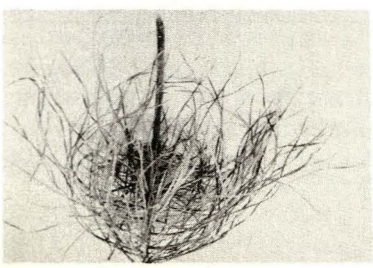


Development of conifer seedlings in the nursery can be controlled by regulating light (above) and nutrition. In experiments with supplemental light at the Laurel Center, seedlings that received 20 hours of daylight (extended day, upper right) grew faster than those grown in natural daylight (right).

Growth response was greater at the higher nutritional levels. The difference between the pots (from left to right) shows this.

At low nutrition, loblolly pine seedlings responded poorly regardless of light, and showed characteristic deficiency symptoms (below). The magnesium-deficient seedling has a dead top, and the long drooping needles are yellow and brown, except for green needle bases. The potassium-deficient seedling has shoot curvature; the short terminal needles are twisted and purple; and the longer fascicular needles are brown except for green needle bases.

LOW IN MAGNESIUM



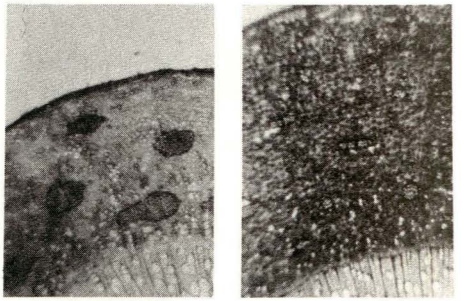
LOW IN POTASSIUM

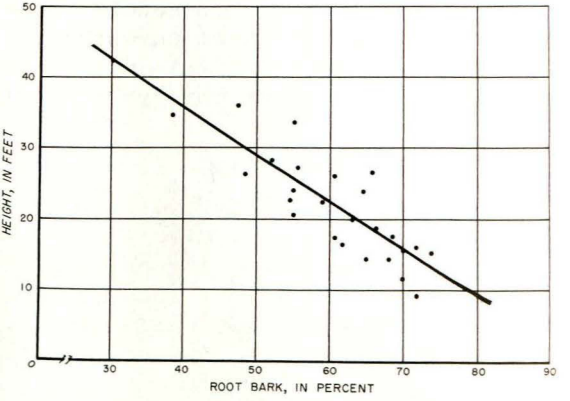
A SUPPORTING STUDY IN GENETICS RESEARCH

←This excellent hybrid poplar (left), at Chestnut Hill, Pa., is 13 years old, 80 feet tall, and 17 inches in diameter. The production of such hybrids is the result of long research and widespread testing.

Much of the test-planting of hybrids and provenances could be eliminated if we had reliable criteria for early selection for desired characters. Recently we found that certain root-anatomy aspects of plants 1 year old from cuttings can be used to predict relative growth rates at a later age.

Fast-growing clones are characterized by a small amount of bark and a high percentage of bark fibers (below, left), as compared to slow-growing clones (right). ↓





The scatter diagram depicts the highly significant relationship of height at 9 years to root bark percentage of 1-year-old cuttings. →

Watershed Management

OUR watershed-management research program is carried on at five of our experimental forests and at three experimental forests of our cooperators.

In the southern portion of our region research has been conducted in the Allegheny mountains of West Virginia at the Fernow Experimental Forest since 1948. Here nine experimental watersheds are being studied, four of which were recently treated to a range of cutting practices that produced a range of summer water yields and water qualities.

To the east, in the Piedmont of Maryland, studies are being carried on at three experimental watersheds by the Bureau of Water Supply of the City of Baltimore. As in our other two cooperative programs, the Baltimore program was jointly conceived, and is being carried out under the technical supervision of the Station and with the physical facilities of the cooperator.

Our northernmost watersheds are at the Hubbard Brook Experimental Forest in the White Mountains of New Hampshire, a 7,500-acre forest set aside in 1955 for research. Four watersheds are being gaged and a number of associated soil, snow, and climatic studies are under way. Just to the west, in the Adirondacks, snow studies in the conifer-hardwood types are in progress.

Between these northern and southern limits, bracketing our region, are a number of watershed studies in Pennsylvania and New Jersey. These include the three small experimental watersheds operated cooperatively with us by the City of Newark, the three watersheds of the School of Forestry of The Pennsylvania State University, another cooperator, and the Station's two watersheds on the Delaware-Lehigh and Pocono Experimental Forests.

At each location our primary objective is to determine the streamflow regimen under the watersheds' present forest condition, and the changes in streamflow that result from treating the forest cover. Results are interpreted in respect to water yield, water quality, and flood prevention. To understand better the effects of watershed treatment,

separate studies are made of pertinent components of the hydrologic cycle.

These studies require daily measurements of streamflow, precipitation, and air temperature, and periodic measurements of water quality, snow depth and water content, infiltration, and soil moisture. In the coastal plains of New Jersey, groundwater elevation--rather than streamflow--is the focus of watershed research.

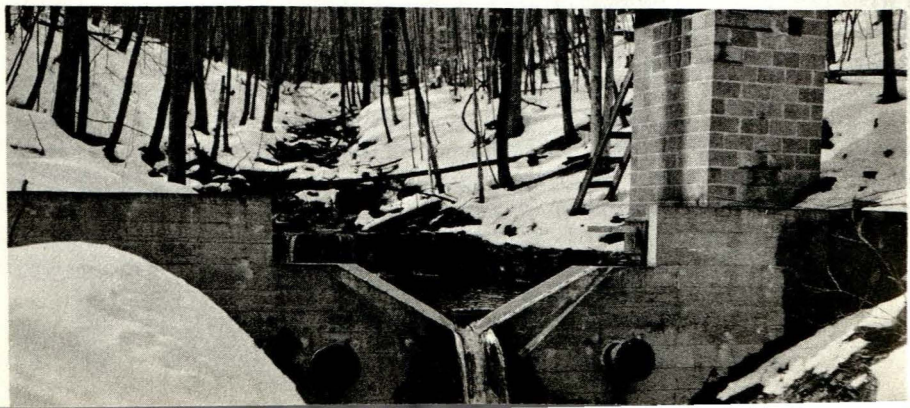
From these measurements we hope to answer such questions as how water yield from municipal watersheds can be increased, how the flood-prevention potential of forest cover can be exercised, how common forest conditions and management practices affect streamflow and groundwater, and how various forest land uses affect water supplies.

Our customers are the 375 municipalities in the Northeast that draw either part or all of their water supplies from forested watersheds or store water in reservoirs whose shorelines are protected by forest land. These serve about a third of the region's population.

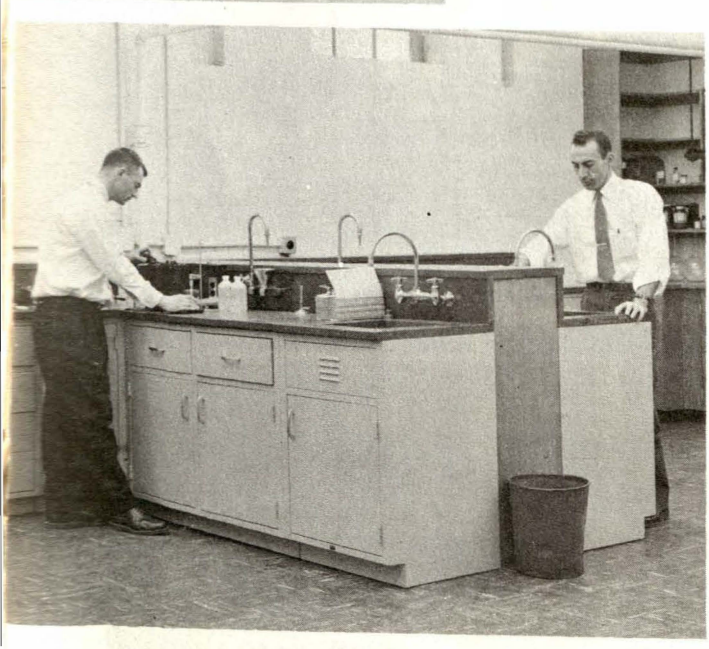
And, among our customers are those who suffer damages from flood flows that come from forested lands, lands that might be managed to provide better water control if we knew how, when, and where the forest cover influences peak flows.

WATERSHED RESEARCH TOOLS

Much of our watershed research depends on continuous measurements of the various elements that affect the water regimen of forested land. Some of the instruments we use are shown here. Below is a weir and gaging station, used to measure and record streamflow. On the facing page, reading clockwise from the top, are: an installation at a climate station; measuring stemflow from trees; measuring the winter snowpack; and laboratory determination of soil properties.

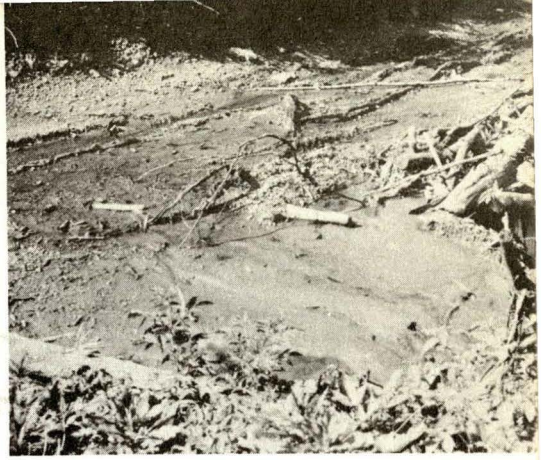


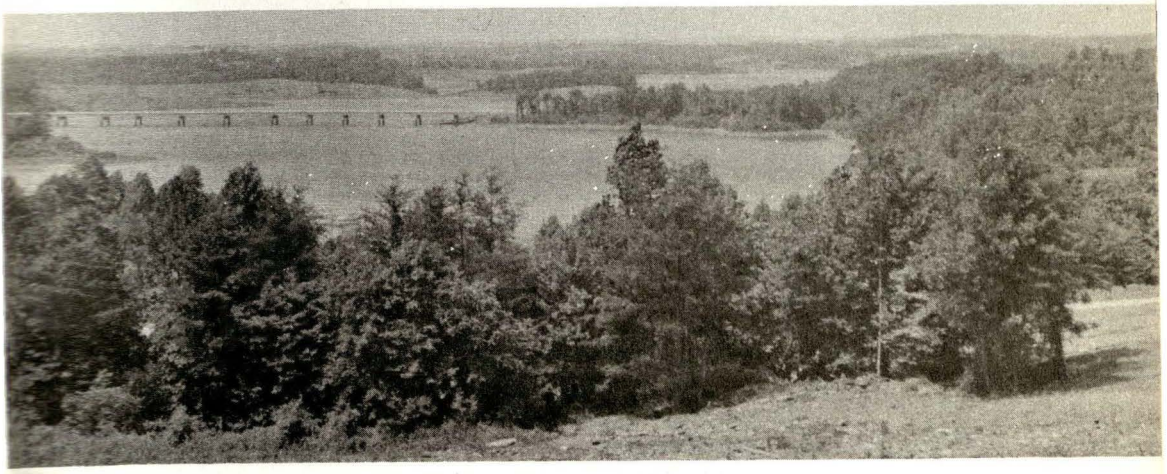
WATERSHED RESEARCH TOOLS



THE FLOOD PROBLEM

Some of the causes of the flood problem can be traced to man's use of the land. We are measuring the effects of forest treatments on the creation of flood conditions--not only those treatments that damage watershed values, but also what we consider good forest-management practices and their effects on snowmelt and flood peaks.

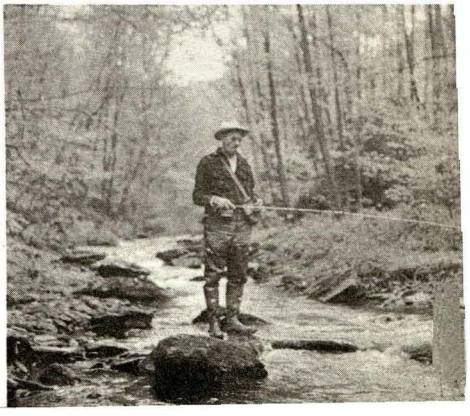




WATER YIELD & QUALITY

Forest practices--both good and bad--affect water quality and water yield. For example, silt-laden water from logging roads (two top photos) pollutes downstream supplies.

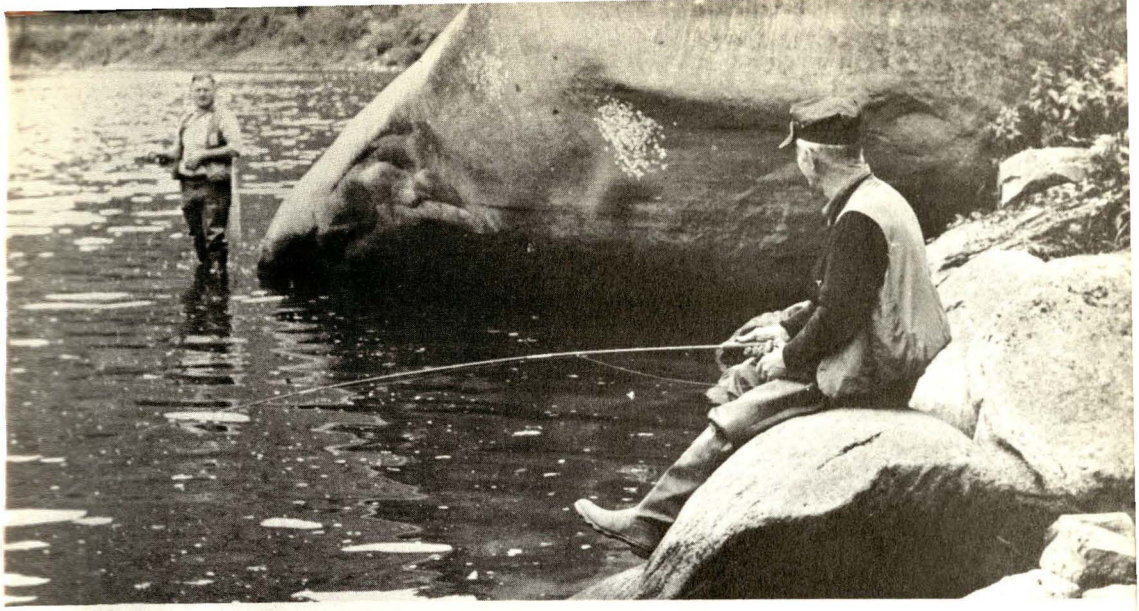
It is the combination of rainfall and water stored and released by the forest land that determines whether the fisherman below will find a dry streambed or a lively stream. Both bottom photos show the same spot.



Forest Recreation and Wildlife Habitat

In the Northeast, 48 million people live on less than 6 percent of the Nation's land. Many of them live in great urban complexes amid crowding, noise, and traffic. Access to the outdoors--to beauty, space, and quiet--can give these people opportunities to recreate their individuality and a zest for living. As people searched for these values, there were over 96 million man-days of recreational use on the Nation's National Forests alone in 1959. This is equivalent to every person in the United States spending half a day a year on a National Forest.

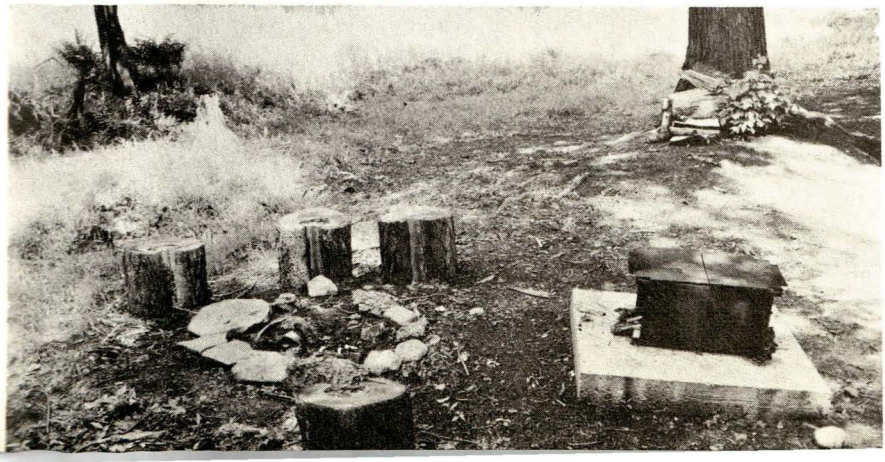
As more and more Northeasterners seek relief from the pressures of urban living, the region's 76 million forested acres will have to provide increasing opportunities for outdoor recreation. Some increase can be obtained from better use of existing recreation lands, and additional opportunities for recreation can come from lands that are also producing timber, water, wildlife, and other products.



Outdoor recreation includes many activities--from crowded beaches and campgrounds to mountain streams or spacious natural areas where the scars of civilization are kept to a minimum. One of the functions of research is to develop information that will help land managers decide how much and what kinds of recreation can be produced on forest lands that must also provide people with other products and services.

In addition to examining physical resources, research must evaluate the desires of people, and develop designs in recreation facilities that will fulfill the desires of visitors and at the same time protect the resource.

Forest recreation research is not a single discipline but draws upon sociology, economics, ecology, psychology, engineering, and other fields of science as well as upon the accumulated experience of management to devise principles and tools for use by administrators of public and private forest recreation lands.



In the Northeast, hunting and fishing are two favorite forms of outdoor activity. Thus closely associated with our recreation research is wildlife-habitat research.

← Most of the requirements of major game species for food and shelter have been determined. It is known, for example, that a turkey habitat requires extensive areas (over 4,000 acres) of large or mature timber. Turkeys also need numerous clearings with a growth of grasses, which are an important part of their diet in late winter and early spring. These clearings are also used for nesting, strutting, and dusting; and they provide an abundance of insects, which are the principal diet of young turkeys.

Management for forest game has often failed to give adequate consideration to condition of the habitat either for the sustained production of game or wood. Special efforts to provide deer browse, and food and shelter for other game, are justified as emergency measures during the period of transition to sustained-yield management of game. →

Among our first studies of wildlife habitat are those aimed at developing new techniques and methods for (1) improving and standardizing measurements of food and cover and for (2) defining the condition and trend of the habitat in different timber types, stand conditions, and stages of forest succession. →

← To provide a sustained yield of game and timber, much must be learned about the relationships between stages of forest succession, patterns and intensities of timber cut, and the response of forest game. With this knowledge, coordinated systems of timber and wildlife management must be devised and tested so that an optimum sustained yield of each resource can be maintained.

Forest Insects

OUR program in forest insect research aims at making better use of all biotic factors in controlling destructive insects. This requires detailed knowledge of the life history and behavior of the major pests, the key factors affecting their abundance and distribution, and their real effects on host trees and the forest community. It requires a better understanding of *when* and *where* to take action, as well as *how* to do it. This is biological control in its broadest sense.

The work is centered at our Forest Insect Laboratory in New Haven, Conn. Here a permanent staff of seven entomologists, one biologist, and four technicians carry out studies in the subject-matter fields of insect biology, insect pathology, silvics, chemical control, and sampling and survey techniques. Another entomologist is stationed at the Laurel Research Center.

Uncertainty about the speciation pattern and taxonomic status of several major insects and insect groups is a real obstacle to biotic control. For example, the white-pine weevil and its ringer, the pine weevil *Pissodes approximatus*, cannot be distinguished positively even by the most careful scrutiny. Interbreeding in the laboratory has produced viable offspring through several generations. Host preferences and behavioral activities differ. Yet the important question remains--to what extent, if any, does interbreeding occur under natural conditions? And are the two insects mutually susceptible to specific biotic control agents? A study of *Pissodes* speciation is under way in cooperation with the Canadian Division of Forest Biology.

Pine sawflies of the genus Neodiprion are also in a state of taxonomic confusion. The use of a polyhedral virus for control of the European pine sawfly, *N. sertifer*, is now on an operational basis in several states. A virus spray has been used successfully against the Virginia pine sawfly, *N. pratti pratti*, and we know that this virus and that of *N. sertifer* are reciprocally pathogenic. Virulence is greatest, however, when applied against the original host. Understandably, in developing this highly effective and practical means of control, it is necessary to know just what insect you are dealing with and what virus you are using.

This axiom was borne out this year by a field test of a virus spray against forest tent caterpillar in Pennsyl-

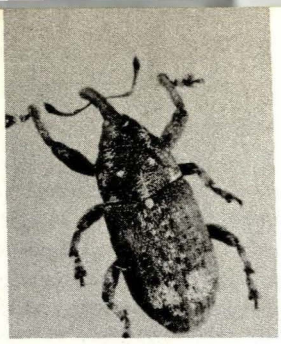
vania. The pathogen was the polyhedral virus of the Great Basin tent caterpillar, which had been propagated in eastern tent caterpillars in the laboratory. Both forest tent caterpillars and eastern tent caterpillars were present in the experimental spray area. High mortality of the latter occurred following spray application, but the forest tent caterpillar survived in large numbers. The carryover effect and the possibility of an epizootic of the disease in both insect populations will be checked in 1961.

Other virus studies are being conducted with the gypsy moth, red-headed pine sawfly, and elm spanworm. In addition, plans are being developed for detailed study of culture techniques and large-scale identification of forest insect pathogens, particularly bacteria, in cooperation with the University of Connecticut.

We are involved also in a variety of projects with entomophagous insects. A comprehensive list has been prepared for publication of all releases and recoveries of forest insect parasites and predators in the United States through 1960. One species of imported predaceous beetle was recovered this year in the Penobscot Experimental Forest, where it had been released in 1959 for control of the balsam woolly aphid. An established dipterous predator of this pest was collected in the Northeast and shipped to the Southeastern Station for release in the Mount Mitchell infestation. And an imported parasite of the larch casebearer, now established in local infestations of the host insect in the New England States and Maritime Provinces, was collected and shipped to the Intermountain Station for release in a newly discovered casebearer infestation near St. Maries, Idaho.

A small study was conducted of the persistence of gypsy moth parasites in an area subjected to intensive spraying by DDT. Periodic collections of gypsy moths at three locations on Cape Cod yielded an egg parasite, a hymenopterous parasite of small larvae, and four tachinid parasites. Two of the latter, originally imported from Europe, have never been recovered before on the Cape. Interestingly, the gypsy moth wilt disease, or polyhedrosis, was evident at one location. More basic knowledge of the natural enemies of our major pests and the complex interactions of host, parasite, and environmental factors is needed to better understand and utilize this approach to biotic control.

The feasibility of using gamma radiation to produce sterility in gypsy moth males and to produce other lethal effects in subsequent generations is being tested in cooperation with the Brookhaven National Laboratory. Experimental



The white-pine weevil is our best-known pest. ←

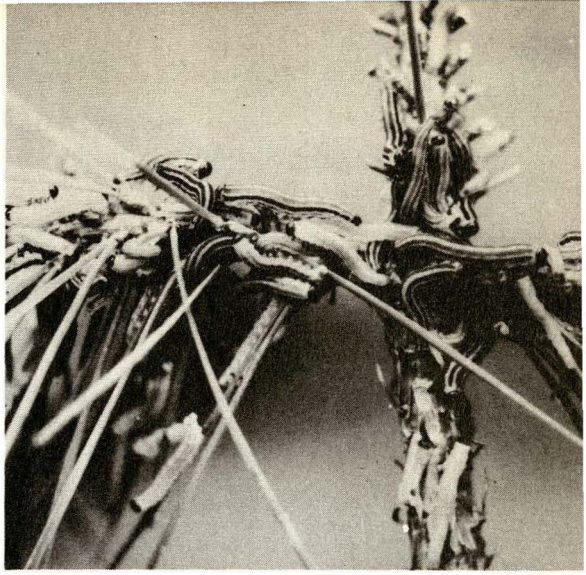
lots are maintained for study and examination at the New Haven Laboratory. This method of control, so successful with the screw-worm in the South, could be effective also with the gypsy moth, because the female moth does not fly, and mates just once. Genetic control by this and other means, such as interracial crossing to produce sterility, may be one more weapon in our anti-insect arsenal. Genetic manipulations have the advantage of extreme specificity but, as with other alternatives to chemical control, special knowledge is needed to achieve positive results.

Two current white pine provenance studies involve a consideration of resistance to the white pine weevil. One outplanting at New Haven comprises twelve seed sources and is now in its sixth year. This experiment is designed to provide information about the variation in weevil injury (by larvae and adults) between and within provenances, with a measure also of grouping effects. The other outplanting, begun this year, includes 21 provenances. No conclusive results have been shown as yet by either study. Heritable resistance to insect attack and injury is a critical factor in forest tree improvement.

These studies indicate the direction and scope of our forest insect research program. Other 1960 projects include a study of the life history and behavior of the white pine cone beetle, an intensive rearing experiment with the gypsy moth, a serological study of the gypsy moth polyhedrosis, preliminary study of the pine leaf aphid, a field test of color aerial photography for appraisal of damage by the balsam woolly aphid, chemical-control tests against the white-pine weevil and other destructive pests, and the screening of candidate chemicals for repellency-deterrency against the smaller European elm bark beetle, the primary vector of Dutch elm disease.

Many of our studies are conducted in cooperation with universities, state and other federal agencies, and private organizations. To them much credit is due for our progress toward the goal of effective biotic control of insect pests and a sound integration of all preventive and suppressive measures.

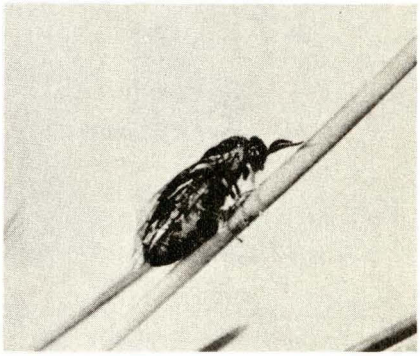
SAWFLIES
& CONE BEETLES



→

A colony of sawfly *(Neodiprion pratti pratti)* larvae feeding on Virginia pine. The current outbreak of this insect covers over 10 million acres in Maryland, Virginia, and North Carolina.

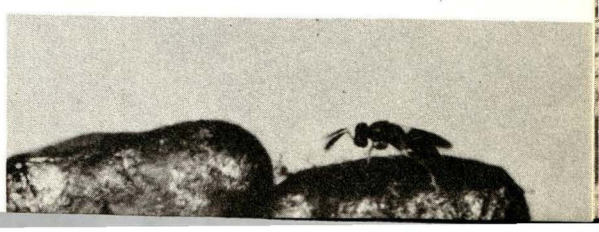
An adult female sawfly laying eggs on a pine needle. Surveys made at this stage provide a basis for predicting population levels and damage, and for deciding on the need for control action. →



Young red pines defoliated by the European pine sawfly *Neodiprion sertifer.* →

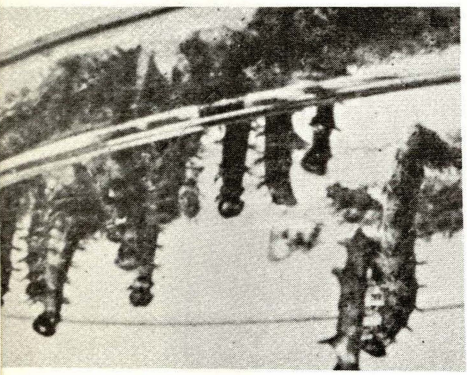
This parasite *(Dahlbominus fuscipennis)* attacking a sawfly pupa is one of the natural enemies of sawflies. It has been reared and released to control pine sawflies in New Jersey and Virginia.

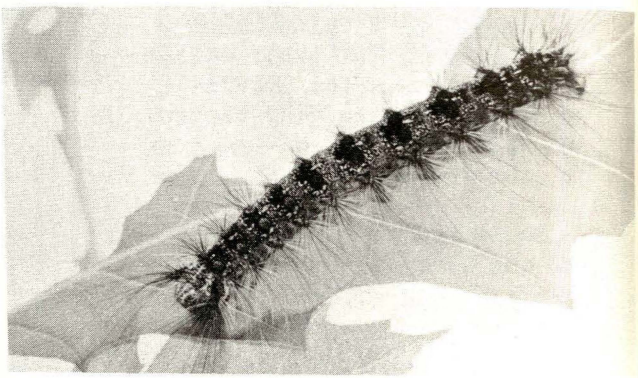
↓ White pine cones killed by the cone beetle *Conophthorus coniperda.* After attack the cones die and fall prematurely to the ground. This is more than a nuisance when a good seed crop is desired at a particular time.

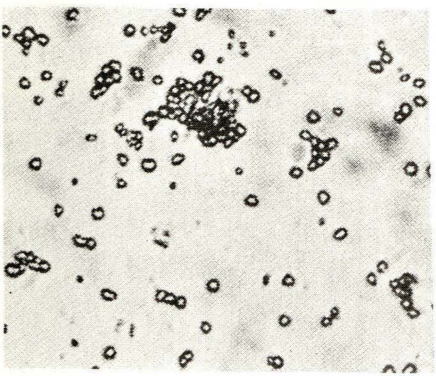


USING POLYHEDRAL VIRUS TO COMBAT INSECTS

In one biological-control method used to combat insects, a polyhedral virus is extracted from diseased larvae by centrifugation. Used as a spray solution in infested areas, the virus is effective only against the particular insect and its close relatives. Our Laboratory at New Haven has been preparing virus solutions for use against the European pine sawfly, gypsy moth, and forest tent caterpillar.

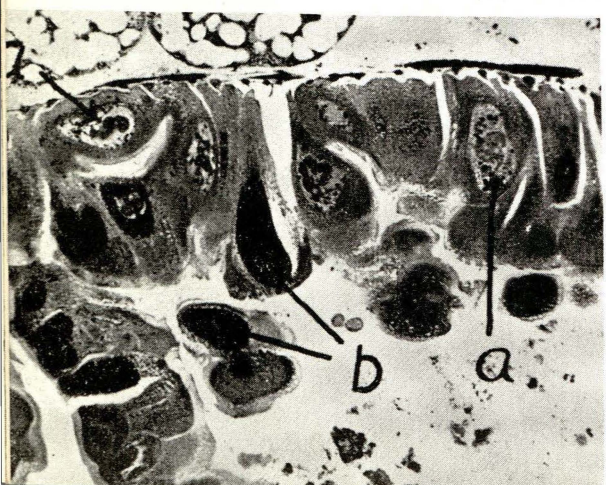






↑ Above, a normal gypsy moth larva feeding. Top left, larvae killed by polyhedral virus and collected for use in preparing virus solution.

← Polyhedral bodies in the prepared solution, as seen under microscope.



← A cross-section of a virus-infected larva, showing development of polyhedra (300X). a: polyhedra formed in nuclei. b. polyhedra-filled nuclei.

Forest Diseases

OUR Division of Forest Disease Research attempts to develop methods of protecting forest tree species against losses from disease, thus making it possible to increase and stabilize yields, conserve timber, and place timber production in the Northeast on a better economic basis. Causes of disease are determined, symptoms are defined, probable and potential damage is estimated, and the need for control is determined. Control measures are then developed and tested.

Research includes studies of infectious pathogens such as fungi, bacteria, viruses, and nematodes, and of injurious environmental factors such as climate, industrial fumes, and other phytotoxic substances.

Discolorations and decays of timber are of vital concern to foresters, to timberland owners, and to wood-using industries in the Northeast. We are carrying on research designed to determine losses due to rot, relationships between hosts and parasites, and how losses may be reduced. This research includes studies of defect in balsam fir, spruce, and red maple; studies of decay in northern hardwood sprouts; logging-damage studies; and large-scale inoculation studies with the principal wood-rotting fungi.

Of the root-rotting fungi, *Fomes annosus* is the most important one being investigated in the Northeast. This fungus is especially serious in plantations. Information about its extent, severity, and how to reduce present and potential losses from the disease is one of our most pressing needs.

Of the nursery diseases, root rots seriously cut yields of the five top coniferous species grown in the Northeast. Studies are under way to determine which chemicals and nursery practices will best control the causal organisms.

Plantation diseases are also being studied. The variety and complexity of leaf-cast fungi in plantations is one problem. We are searching for protective and eradicant sprays, and for disease-resistant trees.

A large number of serious canker diseases attack both conifers and hardwoods. All of them cause degrade of lumber, but some of them girdle and kill trees, others allow rots to

enter the trees, and many weaken the trees, causing wind breakage. The beech nectria disease is one of our most serious cankers. It is causing extensive mortality in many parts of New England and New York. Plans are being made to study the long-distance spread of the disease, biological control, and the physiology of the fungus.

Losses of unknown cause also concern us. A decline of oaks, most severe on scarlet oak, is responsible for the breaking up of numerous stands. The disease is most damaging in an 8,000-square-mile area in north-central Pennsylvania, in the southwestern part of New York, and in eastern West Virginia. A similar condition exists in parts of Virginia and at places in the Southern Appalachians. Research has not yet established the cause. A root pathogen has been isolated from affected trees and inoculation tests are under way.

Ash is dying from an unknown cause in a number of places in the Northeast. The situation is severe in southeastern New York. The trees decline in growth 5 to 15 years before death. Sweetgum blight is still causing extensive loss to stands in the Maryland-Delaware area as well as in places through the South. Tests are under way to determine relationship to site factors.

Nematodes are present in all forest soils, but their effect on forest trees is not known. A recent investigation revealed more species and individual nematodes in recently clearcut areas than in the adjacent uncut forest. The effect of these nematodes on young birch tree reproduction in these cut areas is being investigated.

EFFECTS OF SOME DESTRUCTIVE DISEASES

The fungus *Fomes annosus* has created one of the major forest disease problems in the Northeast. It kills many conifers and seriously rots others, causing great damage in plantations after thinning.

The bracket type of fruiting body shown on this red pine stump (top) is not common. Usually the fruits are irregular, and concealed beneath the forest litter, like the one at the base of the stump (left).

← This white pine tree was windthrown after its roots had been rotted by *Fomes annosus*. The white undersurface of the fungus fruiting body on the roots has been exposed by the tipping of the tree.

The decline and death of ash trees is of growing concern, particularly in southeastern New York. The cause is unknown. →

The dead trees were
lled by oak wilt. If
wilt is not control-
it may spread
ough root grafts to
rt new infection cen-
s. It also may spread
rland for consider-
e distances.

DISEASES GET STARTED IN DIFFERENT WAYS

↑ Decays may get into a tree through any wound--even one caused by use of a forester's increment borer.

← Careless injuries to roots during logging make ideal entry for root and decay fungi.

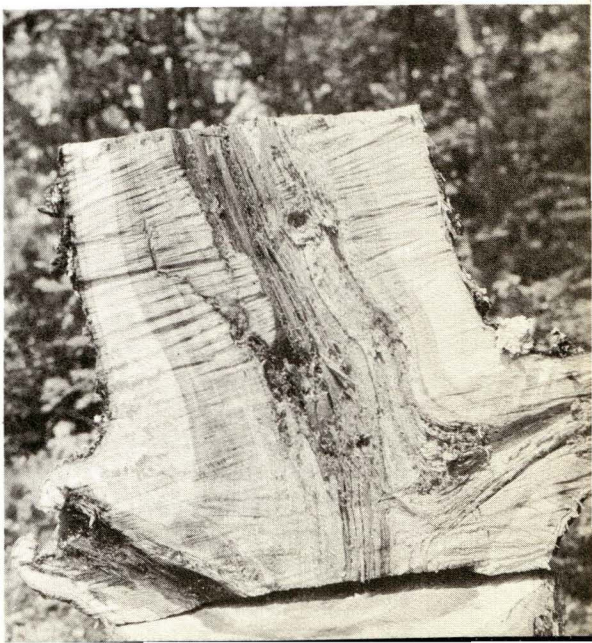
← Decay often gets into young sprouts from a decayed parent stump.

← Ice storms provide countless avenues of entry for disease-causing fungi.

DISEASES SLOW GROWTH AND CAUSE SERIOUS DEGRADE IN TIMBER

A fungus conk on a stem may mean only a few feet of rot--or it may mean that the tree is entirely cull. This paper birch, infected with *Poria obliqua*, proved to be completely worthless.

Strumella cankers of oak, like this one, predispose trees to blowdown and provide entry for decay fungi.



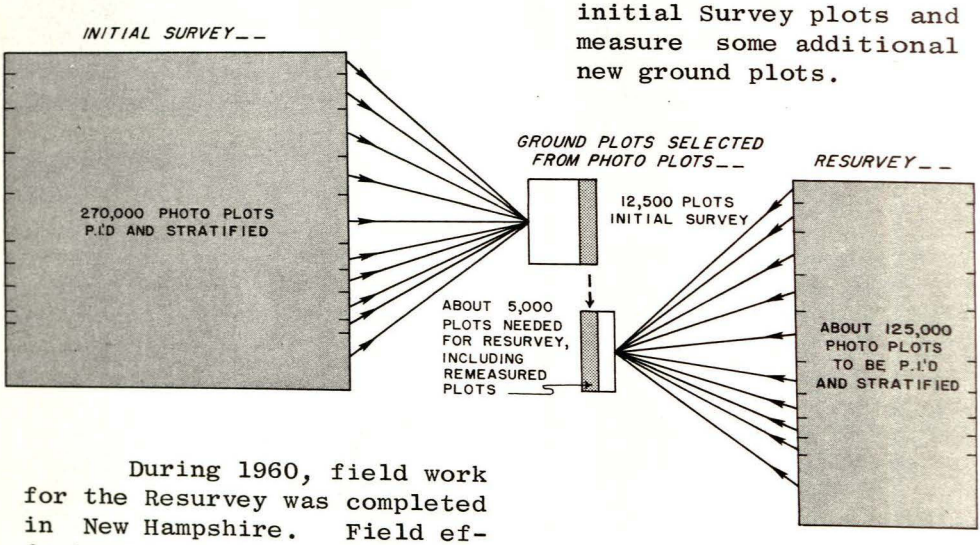
This cross-section, cut from the upper part of a red maple (26 feet above the stump), shows that rot extends from the base all the way to the upper branches. Such rots --this was caused by *Polyporus glomeratus*--reduce the economic importance of this species.

Forest Economics

THE FOREST SURVEY

THE initial Forest Survey of the Northeastern States was completed in 1959. We used what we call a double sampling with stratification. Some information was interpreted from a large number of sample plots marked on aerial photographs, some from a sample of these plots from which permanent field plots were established on the ground.

We have begun a Resurvey to keep timber-resource information up-to-date and to provide a basis for policy and action decisions on various levels. For this we plan to remeasure a sample of the initial Survey plots and measure some additional new ground plots.


INITIAL SURVEY__
270,000 PHOTO PLOTS P.I.'D AND STRATIFIED
GROUND PLOTS SELECTED FROM PHOTO PLOTS__
12,500 PLOTS INITIAL SURVEY
ABOUT 5,000 PLOTS NEEDED FOR RESURVEY, INCLUDING REMEASURED PLOTS
RESURVEY__
ABOUT 125,000 PHOTO PLOTS TO BE P.I.'D AND STRATIFIED

During 1960, field work for the Resurvey was completed in New Hampshire. Field efforts were continued in West Virginia by Forest Survey crews and personnel from the Elkins Research Center. They remeasured plots from the initial West Virginia survey of 1946-49 and established new ground plots.

Meanwhile we are engaged in research designed to aid in planning and executing the Resurvey. For example, we want to determine the best allocation of funds between photo and field plots, and then, for field plots, between new plots and remeasured plots. We want to find the best method for estimating timber cut. One question we want to answer is: Can site productivity be determined from airphotos? How? And we want to develop a computer program for processing Forest Survey data.

Softwood planting on poorly stocked forest land.

PRODUCTION ECONOMICS

Our recent appraisal of three investment possibilities appropriate for those interested in timber production in Pennsylvania provides an example of production-economics research results. The illustrations on this page show how these three investment possibilities compare in profitability.

Forests can be made to produce more if we invest time, effort, money, and materials in managing them. In our research we attempt to determine the profitability of forest-management investments that interest various groups of people, and to devise methods that will help owners and managers choose among the investment opportunities.

Cleaning & cull tree removal in young hardwood stands.

Thinning in hardwood pole-timber stands.

Among our current studies is one designed to find the relationship between size of individual holdings and stand conditions in West Virginia. We are also studying the impact of better information on the management decisions of woodlot owners in New Hampshire.

MARKETS & MARKETING

Forestry does not end at the stump. The profitability of forest-management practices depends on what happens to primary forest products and services after they have been produced and are ready for use.

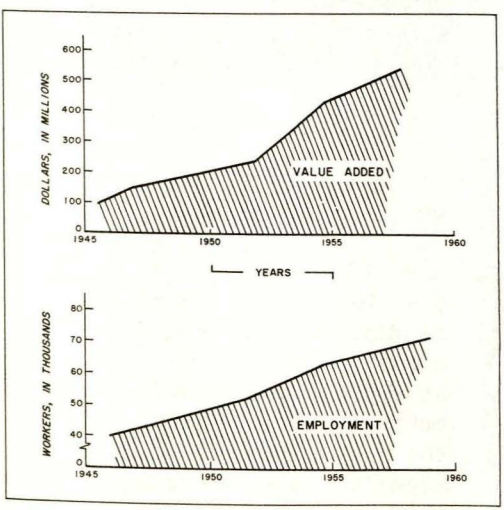
Much of this use phase of forestry is organized around markets. Marketing research aims at finding new ways of increasing marketing efficiency. Both the buyer and the seller can benefit from better product standards, better channels of distribution, and better methods of sale.

We are also interested in the production activities of forest industries, since these industries are the connecting links between markets. What will new demands, new products, and new methods of production mean for these industries?

Our current marketing-research program includes a study of the possibilities for forest industry expansion in West Virginia. Such a study is useful to those who want to know whether this sort of expansion is a feasible method of promoting economic growth and recovery.

Another current study deals with the factors affecting the prices paid for Pennsylvania State Forest stumpage. The results of this study will help owners estimate the sale value of their own forest stands.

THIS IS HOW FOREST INDUSTRIES HAVE EXPANDED IN GEORGIA...



CAN THE SAME THING HAPPEN IN WEST VIRGINIA?

In cooperation with industry, we are conducting logging and milling studies to determine how changes in forest management affect conversion costs. More intensive management means better trees and cheaper conversion. But how much cheaper?

Also, efficient conversion requires that quality be recognized. We are developing white pine log and tree grades and are testing performance of the Forest Service hardwood lumber log-grade specifications on black cherry and other hardwood species for

which detailed yield data have been lacking.

A study of the factors influencing the quality of logs for shoelasts and bowling-pin manufacture indicates that the Forest Service hardwood lumber log-grade specifications will, with certain modifications, meet the needs of the numerous miscellaneous hardwood using industries of the Northeast.

LOOKING AHEAD

There are many different opportunities for more profitable timber harvesting and marketing in the Northeast. Each is available to many people. But how good are these opportunities? Economic analyses of these opportunities could provide information that would help individual owners and managers choose among them.

HERE IS A MATURE HARDWOOD STAND ➧

AND HERE ARE THREE HARVESTING AND MARKETING OPPORTUNITIES

1. TIMING HARVEST FOR MAXIMUM PROFIT

Is this stand ready for sale, or should harvest be delayed? Will the increase in value justify the waiting?

2. MARKETING TREES BY GRADE

How can this stand's quality be recognized? And how will quality influence its sale value?

3. HARVESTING STANDS EFFICIENTLY

What is the best way to harvest this stand? Large or small crews? One product or many? What sort of equipment?

Forest Utilization

SINCE World War II there has been a remarkable change in forest utilization in the Northeast. The region's wood-using industries have steadily increased production and have improved the quality of their output. Part of this was made possible by the fact that they have had more and better raw material to work with. This resulted from decades of forestry effort and time for the forest stands to grow. But technological developments have given these industries the means and incentive to more efficient processing and the production of more useful products. It is this latter field in which the efforts of our Division of Forest Utilization Research are concentrated.

The Station's contribution to improved utilization practices originated with the establishment in 1944 of the Forest Utilization Service. Its initial purpose was to provide liaison between the Forest Products Laboratory and the wood-using industries of the Northeast. It keeps the technologists at Madison advised of the major research needs in this area, and keeps the industries advised of research findings they can use.

Although we have engaged in a few studies of a truly research nature--often in cooperation with universities, equipment manufacturers and individual companies--our major contribution has been in the extension of research results.

Part of our contribution is in publications for general use. For example, our NORTHEASTERN LOGGERS' HANDBOOK has had a distribution of some 70,000 copies (and has been translated into several foreign languages). The Station issues a dozen or more publications each year on new developments in logging and sawmilling adapted to use in the Northeast.

The Division also informs the industry of new developments and new opportunities through talks at regional meetings of trade and technical associations, and through individual assistance to operators who have special problems.

In addition to advising operators of new and better logging and milling techniques and equipment, we have given similar help in the fields of charcoal production, use of

mill residues, wood-drying, machining, and many other aspects of wood conversion.

One of the major efforts of the Division is to encourage and develop uses for the rapidly increasing surpluses of cull and low-grade hardwoods in the Northeast. The Northeast is now growing some 16½ million cords annually of surplus hardwoods--four times as much as our pulp mills now use. Even hardwood sawlog growth is nearly twice as much as current use.

Special efforts have been made to promote the use of these hardwoods. An example is American beech, which we consider an undeservedly under-rated species. A Technical Committee on Beech Utilization was organized, which has prepared 19 reports on various aspects of beech utilization. These have been published and distributed by the Station. These reports, with concurrent industry support, have spurred a considerable increase in the use of beech.

Recently several problems related to softwood utilization have assumed importance. The demand for softwood boards is diminishing. This is of special concern to the manufacturers of white pine lumber, for this species is not well suited to structural uses. In addition, the current wholesale shift of our pulp mills' demands from spruce and fir to hardwoods and mill residues is presenting a challenge to us to find other uses for these softwood species.

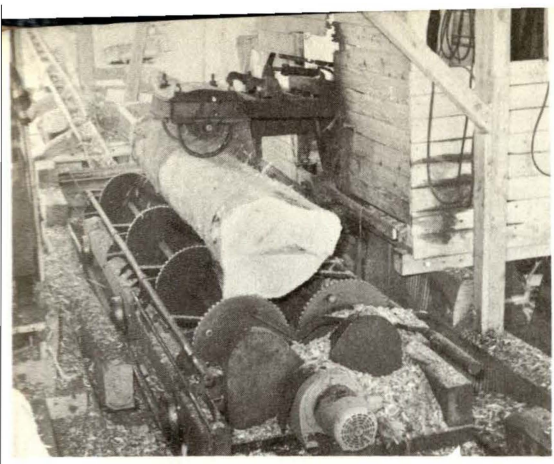
DEVELOPMENTS IN LOGGING

Typical of the postwar developments in logging is the one-man power-driven chain saw. Not too long ago it took a crew of men to fell a tree--with muscle, sweat, and a crosscut saw (below, left). Today, with a chain saw, one man can do the job with ease (right).

MORE DEVELOPMENTS IN LOGGING

↑ Above: in pulpwood handling, use of truck-size pallets eliminates at least one handling of the wood, reduces the truck turn-around time, and keeps the wood moving faster.

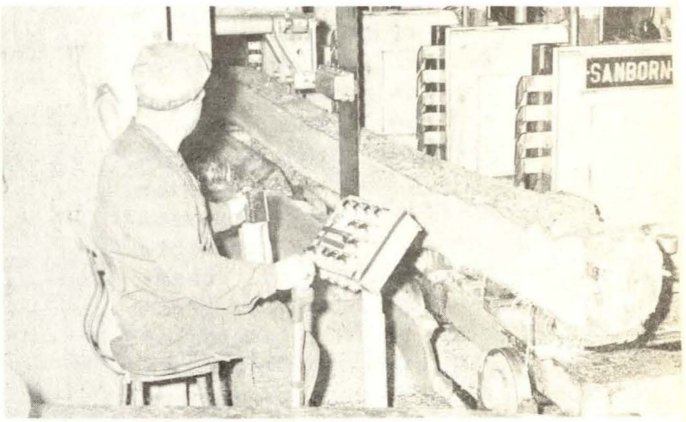
↓ Below, left: a radio-controlled skidder assembles truck loads of logs with only one operator. Below, right; the Muskeg type skidder has reduced costs on many a northeastern logging job.

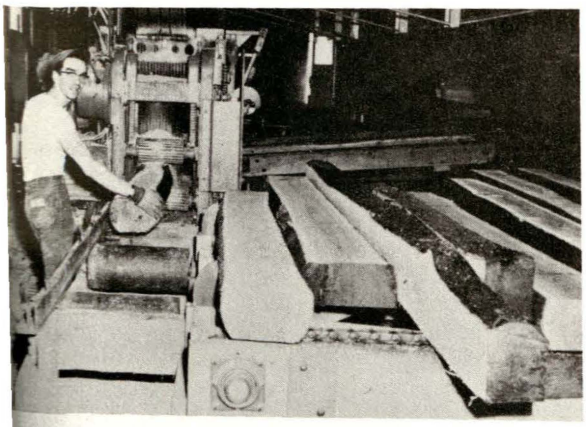


DEVELOPMENTS IN SAWMILLING

← Inexpensive mechanical log barkers have been developed that are suitable for sawmills that cut as little as $1\frac{1}{2}$ million board-feet per year.

→ More than 100 push-button-operated automatic sawmill carriages are in use now in the Northeast. They reduce costs; they improve accuracy and yield of the mills.



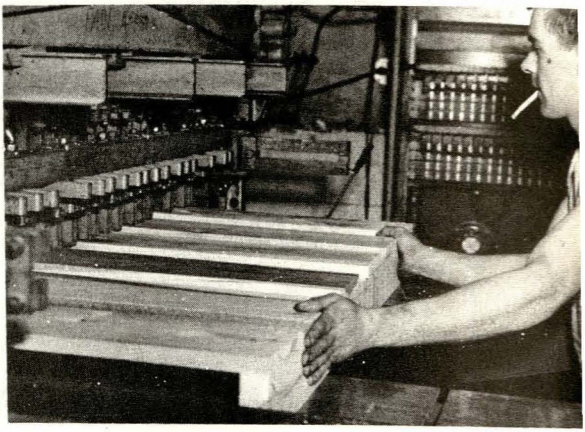


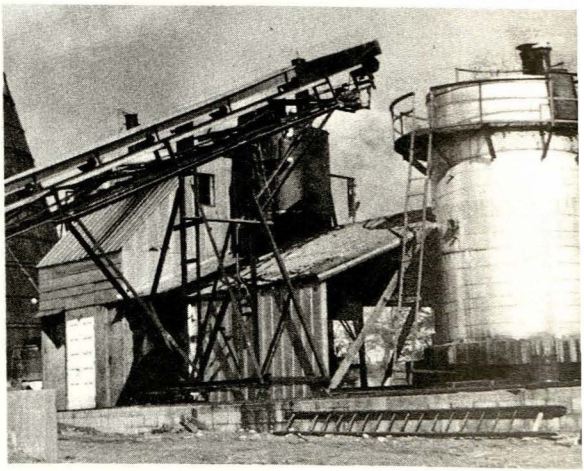
← Using a sash-gang resaw in a small sawmill can double productivity when logs smaller than 15 inches are being sawed.

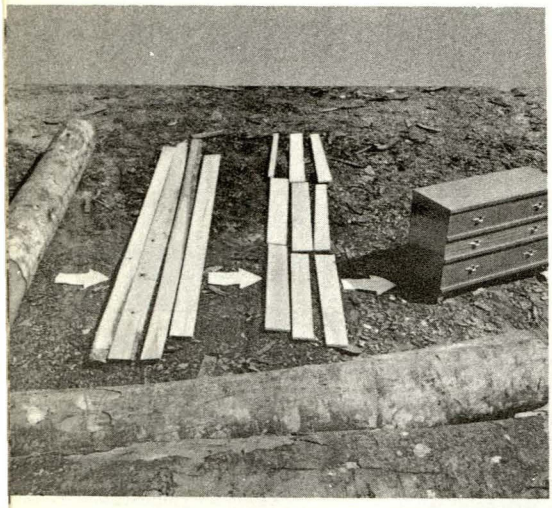
→ Now automatic lumber sorters reduce manpower requirements and result in a better job of stacking lumber for drying.

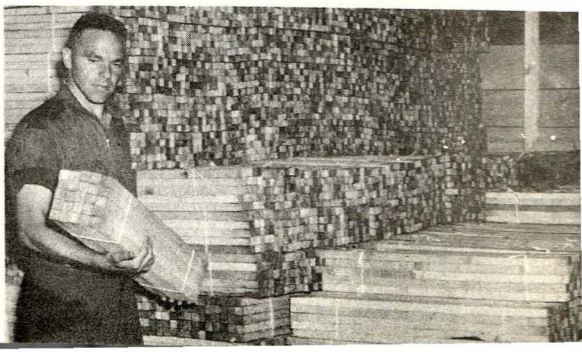
OTHER DEVELOPMENTS IN UTILIZATION

Some other developments in which we have had a part include (clockwise from top); a cooperative chipping plant which assembles slabs and edgings from 12 sawmills in a 50-mile radius and converts them into chips for pulp; the pallet industry, now the fastest growing segment of the lumber market; the semi-automatic charcoal retort; production of furniture dimension stock, making possible utilization of short cuttings from low-grade logs; and utilization of more beech, made possible by use of modern logging, milling, drying, and machining methods.









Publications

in 1960 by staff members and cooperators of the Northeastern Forest Experiment Station, Forest Service, U. S. Dept. of Agriculture.

General

*Northeastern Forest Experiment Station.
1960. ANNUAL REPORT 1959.
Northeast. Forest Expt. Sta. 78 pp., illus.
A summary and survey of the work of the Station for 1959. Reports activities and progress in the fields of forest management and fire research, watershed management, forest insects, forest diseases, forest economics, and forest utilization. Publications by staff members listed.

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1960. PENOBSCOT EXPERIMENTAL FOREST.
Northeast. Forest Expt. Sta. 30 pp., illus.
A booklet describing research work under way at the Penobscot Experimental Forest near Bangor, Maine. The research, designed to serve the spruce-fir region of Maine and northern New Hampshire, is mainly on forest-management problems.

Forest Management and Fire Research

*Bamford, G. T., and Little, S.
1960. EFFECTS OF LOW THINNING IN ATLANTIC WHITE-CEDAR STANDS.
Northeast. Forest Expt. Sta. Forest Res. Note 104. 4 pp.
Removal of 20 to 50 percent of the basal area of 22- to 50-year-old Atlantic white-cedar stands in thinnings from below was found not to be a desirable silvicultural practice in southern New Jersey. Timber production was not appreciably increased, and development of understory hardwood trees and shrubs was much stimulated, thus creating an adverse situation for regenerating white-cedar after harvest cutting. The authors suggest that early, relatively light thinnings, applied when the trees are about 10 feet tall to favor dominance of about 700 stems per acre, might increase production without undesirable stimulation of hardwood understories.

Banks, Wayne G.
1960. RESEARCH AND FOREST FIRES IN PENNSYLVANIA.
Pa. Forests 40 (2): 33-35, illus.
From as much as a million acres a year burned in Pennsylvania in

*Copies or reprints available from the Northeastern Forest Experiment Station, 102 Motors Avenue, Upper Darby, Pa.

the early 1900's, the average annual burned area has been reduced to about 37,000 acres. To further reduce forest fire losses in the Commonwealth, aggressive research is recommended in the causes and motives of careless and incendiary fires, in devising more effective warning procedures, in improving fire-control organization, in analysis of large fires, in studies of fire behavior, and in developing more effective materials and methods for fire suppression.

*Church, Thomas W., Jr., and Sucoff, Edward I.
1960. VIRGINIA PINE SEED VIABLE TWO MONTHS BEFORE NATURAL CONE OPENING. Northeast. Forest Expt. Sta. Forest Res. Note 102. 4 pp., illus.
On the Beltsville (Md.) Experimental Forest, weekly fellings of cone-bearing Virginia pine trees from August 2 to the time of natural cone opening in late October, with weekly collections of cones from both current and past fellings followed by immediate seed extraction and viability tests, showed that cones of this species could be collected as much as 9 weeks before natural opening with assurance of good seed viability.

Diller, Jesse D.
1960. A METHOD FOR "DIRECT SEEDING" CHESTNUTS IN THE FIELD.
North. Nut Growers Assoc. Ann. Rpt. 1959: 61-62.
Describes a practical way of establishing chestnut seedlings at low cost: by planting nuts and then forcing a tin can into the ground around it. This can, with only a small opening in its top, protects the nut from rodents and allows germination.

*Fenton, Richard H.
1960. SEVEN YEARS LATER: EFFECTS OF WILDFIRE IN A YOUNG STAND OF VIRGINIA PINE AND HARDWOODS. Northeast. Forest Expt. Sta. Forest Res. Note 100. 4 pp., illus.
Observations made 7 years after a hot surface wildfire in a 30-year-old Virginia pine-hardwood stand near Beltsville, Md., showed that a pine stand will not become established in such a situation under conditions of natural competition. Although 11,000 pine seedlings per acre started within 2 years, and some 17,000 were present after 7 years, they were being severely suppressed by the surviving overstory and by hardwood sprouts from the bases of fire-killed stems. Practically all pine seedlings seem destined to die from suppression unless released.

*Filip, Stanley M., Marquis, David A., and Leak, William B.
1960. DEVELOPMENT OF OLD-GROWTH NORTHERN HARDWOODS ON BARTLETT EXPERIMENTAL FOREST--A 22-YEAR RECORD. Northeast. Forest Expt. Sta., Sta. Paper 135. 7 pp., illus.
Records from 50 quarter-acre cruise plots in old-growth northern hardwoods on the Bartlett Experimental Forest in New Hampshire reveal an average increase in basal area from 104 to 127 square feet per acre over a 22-year period. The increase was possible because of past "high-grading" operations; 127 square feet is near maximum stocking for such stands. This growth was associated with a gradual regaining of virgin-forest characteristics. Growth rates in the larger trees held up best in the tolerant beech, sugar maple, and hemlock; the less tolerant red maple and paper birch attain maturity and growth rates decline at 16 to 20 inches; yellow birch grows appreciably slower than most of its associates.

*Gilbert, Adrian M.
1960. SILVICAL CHARACTERISTICS OF YELLOW BIRCH.
Northeast. Forest Expt. Sta., Sta. Paper 134. 18 pp., illus.
A discussion of the climatic, soil, physiographic, and biotic factors that govern the distribution and growth of yellow birch, and a description of its life history--flowering and seeding habits, capacity for vegetative reproduction, and growth characteristics

and behavior from sapling stage to maturity. Among special features of this species are the presence of oil of wintergreen in the inner bark, and its almost unique trait of starting on boulders, logs, or stumps, with subsequent development of stilt roots.

*Grisez, Ted.
1960. SLASH HELPS PROTECT SEEDLINGS FROM DEER BROWSING.
Jour. Forestry 58: 385-387, illus.
A survey of tree reproduction in relation to logging slash and deer damage, made 5 years after a heavy cutting in a black cherry-beech-maple stand on the Pocono Experimental Forest in Pennsylvania, showed substantially more stems of the commonly browsed species present in slash piles than in intervening openings. The protective efficacy of slash piles increased with height up to 2.5 feet, and possibly higher. It is suggested that, in areas of abundant deer, slash should not be reduced by lopping or burning; and slash might even be deliberately placed in openings or other spots where reproduction was most desired.

*Hart, George, and Byrnes, William R.
1960. TREES FOR STRIP-MINED LANDS.
Northeast. Forest Expt. Sta., Sta. Paper No. 136. 36 pp., illus.
In a re-examination of 22 test plantations 10 to 12 years after planting on strip-mined lands in Pennsylvania's bituminous region, hybrid poplars, black locust, red oak, Japanese larch, Scotch pine, and Banks pine were found to have survived and grown best. European larch, Douglas-fir, white spruce, ponderosa pine, and black walnut are not recommended for strip-mine sites. Green ash, white ash, pitch pine, red pine, and white pine showed variable performance and high susceptibility to insect pests in some localities; they have only limited utility for strip-mine planting.

*Hough, Ashbel F.
1960. SILVICAL CHARACTERISTICS OF EASTERN HEMLOCK.
Northeast. Forest Expt. Sta., Sta. Paper 132. 23 pp., illus.
A discussion of the climatic, soil, physiographic, and biotic factors that govern the distribution and growth of eastern hemlock, and a description of its life history--flowering and seeding habits, capacity for vegetative reproduction, and growth characteristics and behavior from sapling stage to maturity. Among special features of this species are a dye extracted from the bark, oil of hemlock from needles and twigs, an astringent from the bark, and several other medicinal preparations used by the Indians and early settlers.

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1960. SILVICAL CHARACTERISTICS OF BLACK CHERRY.
Northeast. Forest Expt. Sta., Sta. Paper 139. 26 pp., illus.
A discussion of the climatic, soil, physiographic, and biotic factors that govern the distribution and growth of black cherry, and a description of its life history--flowering and seeding habits, capacity for vegetative reproduction, and growth characteristics and behavior from the sapling stage to maturity. With its several varieties included, black cherry is notable for its wide botanical range over eastern North America and in the mountains of the Southwest, Mexico, and Guatemala; yet the species is commercially important only in the Allegheny and Pocono Plateaus, and southward locally in the Appalachians.

*Lane, Richard D.
1960. NORTHEASTERN FORESTS: WE SEE THEM FOR THE PEOPLE.
Soc. Amer. Foresters Proc. 1959: 75-77.
An acute outdoor recreation situation is developing in the Northeast, which contains 28 percent of the Nation's population but only 6 percent of the land area. Despite public and private efforts to

provide more outdoor recreation facilities, demand is outstripping development; demand is expected to increase ninefold during the next 40 years. To help meet this demand, research is recommended on how to determine user preferences, how to measure recreation use, and how to select and manage recreation areas.

*Leak, William B.
1960. GIBBERELLIN REDUCES ROOT GROWTH OF YELLOW BIRCH SEEDLINGS.
Jour. Forestry 58: 321.
In a small test of the effects of gibberellic acid upon the growth of month-old yellow birch seedlings at the Burlington (Vt.) Research Center, height growth was only moderately stimulated and root growth was markedly reduced, resulting in a much lower root/stem ratio (dry weight basis) than in untreated plants. The overall effect of the gibberellin treatments was considered to be detrimental to seedling vigor and root/shoot balance in this species.

*Little, S., and Somes, H. A.
1960. SPROUTING OF LOBLOLLY PINE.
Jour. Forestry 58: 195-197, illus.
Although loblolly pine is not a strong sprouter, as compared to pitch and shortleaf pines, a study at the New Lisbon, (N.J.) Research Center has shown that loblolly pines up to 8 years old may sprout after severance of the stem. Sprouting vigor declines with tree age over 2 years, and most sprouts starting on 3-year and older seedlings die off. All sprouts, except an occasional one from a nodal bud, develop from buds laid down in the axils of primary needles, or from minute branches or needle fascicles that originated from such buds. Therefore sprouting can occur after stem severance or mortality only if a portion of the original bud-bearing epicotyl remains alive.

*Marquis, David A., and Bjorkbom, John C.
1960. HOW MUCH SCARIFICATION FROM SUMMER LOGGING?
Northeast. Forest Expt. Sta. Forest Res. Note 110. 3 pp., illus.
A survey to determine the amount and pattern of soil disturbance on a summer logging job on the Bartlett Experimental Forest in New Hampshire showed that logging alone does not scarify enough of the area to assure a good distribution of birch regeneration. Slightly less than one-third of the area was disturbed, less than 10 percent was scarified to mineral soil, and the disturbed parts of the area were very unevenly distributed. Where regeneration of birch is an objective, supplemental scarification treatments will be required.

McConkey, Thomas W.
1960. HELICOPTER APPLICATIONS OF 2,4,5-T SHOW DIFFERENCES IN HARDWOOD CONTROL. Northeast. Weed Control Conf. Proc. 14: 466-471.
In this report on helicopter applications of 2,4,5-T (3 pounds per acre in oil) to release white pine and other conifers from hardwood competition on the Massabesic Experimental Forest in Maine, considerable variation in kills, particularly with respect to red maple, was noted between similar treatments applied in two successive years. Reasons for the inconsistent results are not known, which points up the need for research on the relationships between kills and such factors as seasonal and immediate weather conditions, vegetational condition, and date of treatment.

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1960. RELEASE, BROWSE DAMAGE, AND GROWTH OF YOUNG WHITE PINES.
Northeast. Forest Expt. Sta. Forest Res. Note 108. 2 pp.
In a small study of the effects of release of 4-year-old white pine seedlings from hardwood competition on the Massabesic Experimental Forest, total heights after 7 years were 68 percent more, and diameters were 225 percent more, for released trees than for overtopped

check trees. It was observed also that released trees made notably better recovery from deer browsing damage than did the check trees.

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1960. REPORT ON 1959 FOREST TREE SEED CROP IN NEW ENGLAND.
Northeast. Forest Expt. Sta. Forest Res. Note 96. 3 pp.
One of a series of annual reports on the forest tree seed crop in New England, this note shows that the 1959 crop was light over most of the region. For white pine--a species of major interest--seed production was better than for most other species: heavy crops were reported for eastern Maine, southwestern Vermont, and northwestern Massachusetts; light to medium crops were reported for several other localities. Seed crops in the beech-birch-maple association were generally very light. Generally good crops were not reported for any species.

*McNamara, E. F., and Reigner, Irvin C.

1960. EFFECT OF COMPETITION ON HEIGHT GROWTH AND SURVIVAL OF PLANTED JAPANESE LARCH. Northeast. Forest Expt. Sta. Forest Res. Note 103. 4 pp.
In plantings of Japanese larch after three intensities of site preparation with a rototiller in the scrub oak type on the Dilldown Unit in Pennsylvania, both survival and height growth of the trees increased with increasing intensity of pre-planting tillage treatment. Growth rates for all intensities declined after 3 years, presumably because of increasing root competition from ground cover vegetation that had only been set back--not eradicated--by the tillage treatments. Since a rototiller does not eradicate the ground cover, it is a less effective machine than a bulldozer or rootrake for planting-site preparation in scrub oak.

Santamour, Frank S., Jr.

1960. WESTERN AND SOUTHERN OAKS IN THE MICHAUX QUERCETUM.
Univ. Pa. Morris Arboretum Bul. 11 (1): 7-10.
Of 74 seed collections of oak species native to the western and southern United States, only one has yielded progeny that show any promise for use in the Philadelphia area. Many species did not survive; and surviving species in general are inferior to native northeastern species in ornamental value and in growth and wood characteristics. Quercus nuttalli, the only species showing any promise, has been outplanted for continuing observation of its performance.

1960. NEW CHROMOSOME COUNTS IN PINUS AND PICEA.
Silvae Genetica 9 (3): 87-88.
Although previous work had established n = 12 as the prevalent haploid chromosome number in Pinus and Picea, counts had not been checked in a number of species. Examinations of 7 pine and 11 spruce species growing in the Philadelphia area, and for which chromosome counts had not previously been reported, showed n = 12 to be the normal number in every instance. For several additional species in both genera for which chromosome numbers had been reported, n = 12 was confirmed.

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1960. SEASONAL GROWTH IN WHITE PINE SEEDLINGS FROM DIFFERENT PROVENANCES.
Northeast. Forest Expt. Sta. Forest Res. Note 105. 4 pp., illus.
Among white pine seedlings of 21 provenances, grown in the New Jersey state nursery at Washington Crossing for use in a range-wide provenance test of this species, seedlings of southern origins grew for a longer period of time in the nursery, and to a greater height, than those of northern origins. Differences among provenances in (1) duration of growth, (2) total seasonal growth, and

(3) percentage of growth completed by May 18 were highly significant; and these growth variables were highly correlated with latitude and length of growing season of place of seed origin.

Santamour, Frank S., Jr.

1960. PERFORMANCE OF FIVE SELECTED BLACK LOCUST CLONES AT THE MORRIS ARBORETUM. Univ. Pa. Morris Arboretum Bul. 11 (4): 67-70.
The performance of five Soil Conservation Service selections of black locust, test-planted in 25-tree blocks at the Morris Arboretum in 1950, demonstrate that markedly superior phenotypes can be found among the natural population of this species, and that such phenotypes can easily be propagated by root cuttings. At 12 years from cuttings, the best of the 5 clones averaged 36.9 feet tall, 5.9 inches d.b.h., and exhibited excellent form. The so-called "shipmast locust", which was one of the five clones tested, was inferior to the other four selections in both growth rate and form.

Schreiner, Ernst J.

1960. OBJECTIVES OF PEST-RESISTANCE IMPROVEMENT IN FOREST TREES AND THEIR POSSIBLE ATTAINMENT. Fifth World Forestry Conf. GP/69/II/B. 12 pp.
Variation in inherent resistance to pests among species, races, and individuals is the basis for pest-resistance improvement in forest trees, as in other plants. Selection and breeding of trees for resistance offers high promise of becoming an important means of minimizing pest damage. Much additional research will be required on the mode of inheritance of resistance characters, on variation and inheritance of virulence in pests, on the nature of pest resistance, and on effects of environment on the host-pest relationship. International cooperation will be essential for the most rapid progress.

*Snow, Albert G., Jr.

1960. SILVICAL CHARACERISTICS OF VIRGINIA PINE.
Northeast. Forest Expt. Sta., Sta. Paper 131. 22 pp., illus.
A discussion of the climatic, soil, physiographic, and biotic factors that govern distribution and growth of Virginia pine, and a description of its life history--flowering and seeding habits, capacity for vegetative reproduction, and growth characteristics and behavior from sapling stage to maturity.

Sucoff, Edward I.

1960. DISTRIBUTION AND REDISTRIBUTION OF POTASSIUM, MAGNESIUM, AND CALCIUM IN LOBLOLLY PINE (PINUS TAEDA L.) Plant. Physiol. Proc. Vol. 35 supplement: 22. (Abstract.)
After growing loblolly pine seedlings 7 months in automatically irrigated sand cultures with potassium, magnesium, and calcium levels ranging from deficiency to surplus, external supplies of calcium and magnesium were withheld 2 to 3 months. Distribution of the three elements in the plants at different nutrient levels, before and after withholding Ca and Mg, are reported. Withholding Mg induced redistribution of this element from older to younger needles; withholding Ca did not induce a comparable redistribution.

*Sucoff, Edward I., and Church, Thomas W., Jr.

1960. SEED PRODUCTION AND DISSEMINATION BY VIRGINIA PINE.
Jour. Forestry 58: 885-888, illus.
Seed trapping studies in strip, patch, and seed-tree cuttings of Virginia pine at the Laurel Research Center in Maryland revealed large variations in seed production among trees and stands, and from year to year. Tree density, size, age, and crown class affect seed production, but other unknown factors also are important; the best guide to future production is past production. Most of the seed is wind-distributed from late October through December, and most of it falls within 100 feet of the source.

*Tepper, H. B., and Bamford, G. T.
1960. THINNING SWEETGUM STANDS IN SOUTHERN NEW JERSEY.
Northeast. Forest Expt. Sta. Forest Res. Note 95. 3 pp.
Thirty-year growth records on a sweetgum plot on a good sweetgum site in southern New Jersey showed no appreciable benefits from a low thinning that had been done when the stand was 11 years old. This thinning apparently was too early to exert much lasting effect upon stand growth and volume. Judging by the age at which the growth rate of the unthinned stand began to decline, the authors speculate that a thinning at 20 to 25 years would have increased the growth of residual trees and total merchantable volume production per acre.

*Trimble, George R., Jr., and Barr, Carl R.
1960. COST OF SKID ROADS FOR ARCH LOGGING IN WEST VIRGINIA.
Northeast. Forest Expt. Sta. Forest Res. Note 97. 4 pp.
This paper discusses the main considerations in permanent main skid road construction on the Fernow Experimental Forest, and reports an average cost of $318 per mile. Of this, about 9 percent was charged to road location, 82 percent to actual construction, and 9 percent to after-logging care. Total cost per acre for main and spur skid roads combined was $4.70. Most of these costs are a non-recurring capital investment. The importance of proper lay-out, with grades mostly limited to 10 percent or less, and of after-logging care--mainly installation of water bars--are strongly emphasized.
Also in So. Lumberman, Sept. 1960.

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1960. RELATIVE DIAMETER GROWTH RATES OF FIVE UPLAND OAKS IN WEST VIRGINIA.
Jour. Forestry 58: 111-115, illus.
Studies of the growth rates of northern red, black, scarlet, chestnut, and white oaks at the Elkins Research Center in West Virginia provided comparative data by species, vigor class, and site index, and regressions of diameter growth over site index by species and vigor class. Northern red oak was the fastest growing of the five species. For Vigor I, site index 70, with red oak assigned a numerical growth rating of 1.00, black oak rated 0.90, chestnut and scarlet oaks 0.82, and white oak 0.67.

Watershed Management

*Eschner, Arthur R.
1960. EFFECT OF SCRUB OAK AND ASSOCIATED GROUND COVER ON SOIL MOISTURE.
Northeast. Forest Expt. Sta., Sta. Paper 133. 16 pp., illus.
Soil moisture was consistently highest on areas where scrub-oak overstory and ericaceous groundcover had been deadened and lowest on undisturbed areas. An area covered chiefly by sheep laurel generally had the second lowest soil-moisture content, and a bare area from which the natural humus layer and several inches of topsoil had been removed was generally intermediate in rank.

*Lavigne, Raymond W.
1960. A TIME-CORRECTOR DEVICE FOR ADJUSTING STREAMFLOW RECORDS.
Northeast. Forest Expt. Sta. Forest Res. Note 98. 4 pp., illus.
A graph, with time corrections on the vertical scale and days of record on the horizontal, commonly used to prorate time corrections, was scribed on plexiglas. Adjustable arms were devised for setting 8- and 15-day corrections.

*Lull, Howard W.
1960. FORESTED MUNICIPAL WATERSHEDS IN THE NORTHEAST.
Jour. Forestry 58: 83-86.
Forested municipal watersheds and forest-bounded reservoirs provide and protect water supplies for 360 municipalities in the Northeast, total well over one million acres of forest land, and serve about one-third of the region's population. The growing importance of these areas and trends in their management are discussed.

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1960. WATERSHED MANAGEMENT RESEARCH IN THE NORTHEAST.
Jour. Forestry 58: 285-287.
Watershed research programs are conducted in 7 of the 12 Northeastern States and at 4 universities. In all, 30 experimental watersheds are being studied to determine how forest cover and changes in cover affect streamflow.

*---------- and Pierce, Robert S.
1960. PROSPECTS IN THE NORTHEAST FOR AFFECTING THE QUANTITY AND TIMIMG OF WATER YIELD THROUGH SNOWPACK MANAGEMENT. Western Snow Conf. Proc. 1960: 54-62.
Snowfall, snowmelt runoff, and the influence of forest cover on snow accumulation and melt are evaluated in respect to prospects for snowpack management. The areas of possibility lie largely in New York and northern New England where one-third to one-half of the average annual streamflow comes from snowmelt and rainfall in April and May.

*---------- and Rushmore, Francis M.
1960. SNOW ACCUMULATION AND MELT UNDER CERTAIN FOREST CONDITIONS IN THE ADIRONDACKS. Northeast. Forest Expt. Sta., Sta. Paper 138. 16 pp., illus.
In the spring of 1959, maximum snow accumulation in hardwood sapling and sawtimber stands contained 2 more inches of water than the snowpack in balsam fir and red spruce stands. Snow melted about twice as fast in hardwood stands as in conifer stands. In mixed conifer and hardwood stands, accumulation and melt were intermediate. Accumulation and melt were correlated with canopy closure.

*Reigner, Irvin C., and Sushko, Walter C.
1960. THE BALTIMORE WATERSHED...AN EXAMPLE OF GOOD MANAGEMENT.
Public Works 91: 85-88, illus.
The development of municipal watershed management by the City of Baltimore is described from the building of its first water-supply reservoir in 1862 to its present system of three water-supply reservoirs and the surrounding 17,300 acres of forest watershed land. The forest-management program and the safeguarding of water supply are described.

*Reinhart, K. G.
1960. A SIMPLE FILTER DAM FOR SMALL STREAMS.
Northeast. Forest Expt. Sta. Forest Res. Note 107. 7 pp., illus.
Four simple log-and-post dams were built to filter sediment out of muddy streamflow coming from a heavily-cut watershed with poorly located skidroads. In the year after logging the dams trapped an amount of sediment equivalent to an average of 70 parts of soil per million parts of water.

*Lewis, Franklin B.

1960. HOW TO COLLECT AND PROCESS SMALL POLYHEDRAL VIRUSES OF INSECTS. Northeast. Forest Expt. Sta. Forest Res. Note 109. 8 pp., illus.
Microbial agents, particularly viruses, are potentially one of our most effective means of controlling destructive forest insects. Virus sprays have proven effective against certain pine sawflies of the genus Neodiprion in this country and Canada. To develop this method for practical application, it is necessary to know how the virus pathogen is collected and processed. This note describes the procedure for small polyhedra, which are typical for sawflies. A flow sheet of the centrifugation process is included.

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1960. FACTORS AFFECTING ASSESSMENT OF PARASITIZATION BY APANTELES FUMIFERANAE VIER. AND GLYPTA FUMIFERANAE (VIER.) ON SPRUCE BUDWORM LARVAE. Canad. Ent. 92: 881-891.
Valid and reliable estimates of parasitization in natural populations of forest insects are difficult to obtain. Heterogeneity in the environment affects the occurrence of the host insect and parasite in both time and place, and the behavior of the principals themselves may vary in a biased manner. This paper describes the egg laying behavior of two parasites of the spruce budworm in the laboratory and field, the effects of multiple parasitization by the two species, and the effect of parasitization on the light reactions of 2nd instar spruce budworm larvae.

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Lowe, J. H., Jr., and Mook, P. V.

1960. FOREST INSECT AND DISEASE CONDITIONS IN THE NORTHEAST--1959. Northeast. Forest Expt. Sta. 54 pp.
The relative abundance, distribution, and damage caused by the major forest insect and disease pests in the Northeast during 1959 are discussed briefly. Planned surveys and control projects are covered in more detail. Weather conditions affecting the status and severity of damage by both insects and diseases are described. A tabulated summary is given of the major and minor pests.

*McIntyre, Thomas.

1960. THE VIRGINIA PINE SAWFLY OUTBREAK 1955-59.
Northeast. Forest Expt. Sta. Forest Res. Note 99. 4 pp., illus.
An extensive outbreak of a sawfly on Virginia pine has developed in Maryland, Virginia, and North Carolina since 1955. By 1959 serious defoliation occurred over a gross area of more than 14 million acres in these states. The net acreage of pine and pine-hardwood type effected in 1959 was nearly 2½ million acres. The tree hosts and feeding habits of the sawfly are described. A tabulated summary is given of the gross and net acreage with light, moderate, and heavy defoliation in the years 1955 to 1959 inclusive. The extent of defoliation is shown by categories on a map for each year.

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1960. SAWFLY THREATENS PINE TIMBER.
South. Planter 121 (1): 21, illus.
The Virginia pine sawfly outbreak in 1959 was noticeable to many woodland owners. The sawfly hatches and starts feeding before new growth begins, thus only old foliage is consumed. However, several years' severe defoliation will reduce increment markedly and may increase a tree's susceptibility to attack by secondary insects. The insect is easily controlled by a DDT spray, and a virus spray shows real promise for practical control.

McIntyre, Thomas.

1960. NATURAL FACTORS CONTROL THE PINE TORTOISE SCALE IN THE NORTHEAST. Jour. Econ. Ent. 53: 325.
The pine tortoise scale appeared in outbreak numbers at various locations in Pennsylvania, Maryland, and West Virginia in 1957. Virginia and Scotch pines were attacked. Two coccinellids, Hyperaspis binotata and H. signata, and a predaceous caterpillar, Laetilia coccidivora, almost completely eliminated the scale in all localities. No noticeable infestations were reported in 1958.

*Northeastern Forest Experiment Station.

1960. NORTHEASTERN FOREST PEST REPORTER 1 (1960). Northeast. Forest Expt. Sta. 12 pp. (New Haven.)
First cooperative report of the year on the occurrence of insect and disease pests of forest trees in the Northeast. The unusual abundance of a complex of hardwood defoliators is discussed. Major survey and control projects are outlined.

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1960. NORTHEASTERN FOREST PEST REPORTER 2 (1960). Northeast. Forest Expt. Sta. 6 pp. (New Haven.)
Mid-season report on the status of forest pests. Includes a listing of recent publications of interest.

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1960. NORTHEASTERN FOREST PEST REPORTER 3 (1960). Northeast. Forest Expt. Sta. 10 pp. (New Haven.)
Late season report on forest insect and disease conditions in the northeastern states. The influence of weather on diseases, particularly, is discussed. The phenomenon of multiple leader growth in conifers is described and several possible causal agents are considered.

*St. George, R. A., and McIntyre, T.

1959. POWDER-POST BEETLES IN BUILDINGS--WHAT TO DO ABOUT THEM. U.S. Dept. Agr. Leaflet 358 (revised). 8 pp., illus.
Eight species of powder-post beetles that commonly infest buildings are described. The life cycles range from 1 to 7 years, depending on species and location in the United States. Certain species attack only hardwoods, others attack softwoods, and some are not selective. Both seasoned and unseasoned wood are infested. Methods of control are outlined.

Forest Diseases

* Batra, Lekh R., and Staley, J. M.

1960. OCCURRENCE OF THE SCLEROTIAL STATE OF CIBORINIA CANDOLLEANA (LEV.) WHET. IN THE UNITED STATES OF AMERICA. U. S. Dept. Agr. Plant Dis. Rptr. 44 (6): 430-431, illus.
Reports that Ciborinia candolleana was isolated in 1959 in its sclerotial form from red oak in Pennsylvania. The finding of this fungus is of interest to mycologists but the disease induced by the organism is not believed to be of importance.

Brandt, Robert W.

1960. THE RHABDOCLINE NEEDLE CAST OF DOUGLAS-FIR. N.Y. State Univ. College of Forestry Tech. Bul. 84. 66 pp., illus.
Report on a four-year study of a needle cast of Douglas-fir caused by Rhabdocline pseudotsugae Syd. Chronological development of the disease in New York was intermediate between that described for the

western United States and for Europe. Apothecia were of two distinct types recognizable by size and manner of opening. High humidity favored ascospore dispersal and incidence of infection. Spore dispersal was of longer duration than previously suggested in that needles of lammas shoots became infected. Extension of sporulation period answered questions on: reported sympton differences, 2-year retention of infected needles, apparent infection on 2-year-old needles, and complete defoliation of twigs involving both spring- and summer-produced needles. Economical control by use of fungicides appears almost impossible. Wide divergences in resistance to R. pseudotsugae are evident and the propagation of trees showing resistance seems to be the most obvious and practical approach for future studies.

Diller, Jesse D.

1960. EXPERIMENTAL FARM PLANTINGS OF ASIATIC CHESTNUTS. U. S. Forest Serv. Tree Planters' Notes 40: 1-2, illus.
Reports on distribution of 3,000 Asiatic chestnut seedlings to farmer cooperators in 1959 and an inspection of plantings made 20 years previously. An analysis is made of the different planting practices and plantation management that resulted in either success or failure. The quality of the planting site was the most important factor although severe damage occurred in some places from live-stock grazing. Additions of fertilizers and mulch did not fully correct poor planting sites.

---------- and Koch, E. James.

1960. THE EFFECTS OF ENVIRONMENTAL CONDITIONS ON THE GROWTH OF MERULIUS LACRYMANS. (Abstract). Phytopathology 50: 633.
Test blocks from 13 tree species were exposed to fungus infection in 4 environments: (1) in a crawl space under a basementless house, (2) under a mound of leaves in the woods, (3) in a root cellar, and (4) in a room maintained at 40°F. Manipulation of the pH of the substrata and additions of 4 levels of fertilizers had little effect on percent of weight loss of the decay infected wood. Greatest weight loss (11.1%) occurred on blocks placed under the basementless house, somewhat less on those in the root cellar, still less on those under mounds of leaves in the woods, and the least weight loss occurred on the blocks of wood held in the room at 40°F. The overall weight losses for the 13 wood species varied from 1.9% for Osage-orange to 16.7% for northern red oak.

---------- and Koch, E. J.

1960. SPREAD OF A "HOUSE-DECAY" FUNGUS THROUGH SOIL TO A STANDING VIRGINIA PINE TREE. Phytopathology 50 (8): 571.
In previous experiments Poria incrassata, a building decay fungus, was grown on wood placed under mounds of forest leaves in a wooded area at Beltsville, Maryland. Subsequently several overstory trees died. One of these, a 10-inch d.b.h. Virginia pine broke off 3 feet from the ground during a 1959 windstorm. The bole of the tree was deteriorated by a rot with gross characteristics resembling the decay induced by P. incrassata. Cultures made from the decayed wood became contaminated and the Poria was not recovered. Discs of wood cut from the tree trunk were then placed on the ground and covered with leaves. After 3 weeks a white mycelial growth appeared on six of the surfaces in contact with the ground. The fungus was identified as Poria incrassata. The authors conclude that the fungus had spread from the original infected areas through the soil to the standing tree.

*Fenton, R. H., and Diller, J. D.

1960. SWEETGUM BLIGHT AND DIEBACK OF ASSOCIATED HARDWOODS ON THE BELTSVILLE EXPERIMENTAL FOREST IN MARYLAND. Northeast. Forest Expt. Sta. Forest Res. Note 106. 4 pp., illus.
Survey of incidence of sweetgum blight in three forest types (pine,

pine-hardwood, and mixed hardwoods) indicates that the blight--whatever causes it--is a serious threat to the sweetgums in southern forests. In each forest type, crown-dieback was much more severe and advanced in sweetgum than in any of the associated hardwood species. About one-third of all sweetgums examined were affected with some degree of dieback.

Fowler, Marvin E.
1960. BEECH BARK DISEASE.
Natl. Shade Tree Conf. Arborist's News 25 (1): 1-3, illus.
History, behavior, symptoms, damage, and control of the scale-nectria disease caused by the combined attack of the insect Cryptococcus fagi and the fungus Nectria coccinea var. faginata. Contains a general description of the present knowledge of this important disease, based on the combined research and publications of others.

Shigo, Alex L.
1960. MYCOPARASITISM OF GONATOBOTRYUM FUSCUM AND PIPTOCEPHALIS XENOPHILA.
N. Y. Acad. Sci. Trans. Ser. II vol. 22: 365-372.
Report on a study of the basic principles of parasitism, using two biotrophic fungi, Gonatobotryum fuscum sacc., which is parasitic on species of Ceratocystis, and Piptocephalis xenophila Dobbs and English, which is parasitic on species of Penicillium. The parasitism of one micro-organism by another is receiving increasing attention. The principles involved may serve as the basis for developing biological controls for important forest diseases.

---------- and Yelenosky, George.
1960. NEMATODES INHABIT SOILS OF FOREST AND CLEAR-CUT AREAS.
Northeast. Forest Expt. Sta. Forest Res. Note 101. 4 pp., illus.
Reports great differences in numbers and types of nematodes found in forest and cutover areas and, because of possible effects of nematodes on forest trees, suggests need for further research on nematodes in forest soils. Describes and illustrates a simple method for trapping nematodes, using only readily available and inexpensive materials.

Forest Economics

*Bickford, C. Allen.
1960. A TEST OF CONTINUOUS INVENTORY FOR NATIONAL FOREST MANAGEMENT BASED UPON AERIAL PHOTOGRAPHS, DOUBLE SAMPLING, AND REMEASURED PLOTS. Soc. Amer. Foresters Proc. 1959: 143-148.
A report on a test made on the Allegheny National Forest to develop a more efficient method of obtaining data needed recurrently for timber management. Recommends a forest survey method of continuous inventory based on sampling.

*Ferguson, Roland H., and Longwood, Franklin R.
1960. THE TIMBER RESOURCES OF MAINE.
Northeast. Forest Expt. Sta. 75 pp., illus.
The findings of the forest survey made in 1954-58: history of long past use and present use of the timber resource, the timber inventory, opportunities for increased benefits, current forest programs, 31 tables of forest statistics.

*King, D. B., Stoltenberg, C. H., and Marty, R. J.
1960. THE ECONOMICS OF WHITE PINE BLISTER RUST CONTROL IN THE LAKE STATES.
U. S. Forest Service. 85 pp., illus.
Report on a comprehensive survey of white pine blister rust control opportunities in the Lake States. It discusses the present condition of the white pine resource, the impact of protection and management on regional production, future markets and values for white pine, and economic guides for region-wide rust control programming. A procedure for estimating the costs and returns to rust control in individual white pine stands is also presented.

*Marty, Robert J., and Allison, Glenn R.
1960. APPRAISING WHITE PINE WEEVIL CONTROL OPPORTUNITIES.
Jour. Forestry 58: 203-206.
Presents a method for estimating the return to be obtained from weevil control in young pine plantations in New York. Control costs and a procedure for ranking control opportunities are also discussed.

*Ostrander, M. D.
1960. NEW HARDWOOD LOG GRADES FOR SHOE-LAST AND BOWLING PIN BLANKS.
Forest Prod. Jour. 10 (5): 238-242, illus.
A manufacturer of rough shoe-last and bowling-pin blocks was concerned with the failure of his current log-grading system to satisfactorily segregate logs into value classes. A study of products produced from logs graded by the company system and the Forest Service log grades for standard lumber was conducted. Results indicated that neither system was adequate, but a modified Forest Service system performed quite satisfactorily. The article presents a procedure by which a hardwood specialty mill can modify existing lumber-log grades to meet its particular needs.

*---------- and others.
1960. MARKETING FOREST PRODUCTS FROM SMALL WOODLAND AREAS IN THE NORTHEAST. Pa. State Univ. Agr. Expt. Sta. Bul. 670. 53 pp.
A report on buying practices of primary wood-using industries and other first handlers of rough forest products; and use of marketing assistance and information by forest products buyers and sellers. (Cooperative project NEM-6).

Stoltenberg, Carl H.
1960. NEW YORK'S PHYSICAL ASSETS FOR FOREST INDUSTRY.
N. Y. Forester 17 (1): 2-4.
Cites the nearness of people to the State's forests. Views the

possibilities of expanding wood-using industries by utilizing more small-sized hardwoods. Considers that the raw material for this industry could come from thinning.

*Webster, Henry H.
1960. TIMBER-MANAGEMENT OPPORTUNITIES IN PENNSYLVANIA.
Northeast. Forest Expt. Sta., Sta. Paper 137. 37 pp., illus.
Describes a method for appraising opportunities for planting and for applying timber-stand improvement practices in Pennsylvania stands. It shows that value response per cost-dollar varies tremendously between management opportunities when both stand conditions and practices vary. Emphasizes the need for comparing opportunities before investing.

Forest Utilization

*Graham, Paul H.
1960. BEECH FOR FURNITURE.
Northeast. Tech. Com. Util. Beech and Northeast. Forest Expt. Sta., Beech Util. Ser. 20. 16 pp., illus.
Describes the uses and properties of beech as they apply to furniture making. Also gives the wood's characteristics under conditions of drying, bending, gluing, machining, turning, sanding, and finishing. Notes that the restricted use of beech is due more to lack of knowledge of seasoning and working methods than to quality of the wood.

Simmons, Fred C.
1960. HARVESTING OF WOODS.
In Power to Produce, U. S. Dept. Agr. Yearbook 1960: 212-217.
Describes recently developed machines for harvesting timber on farm woodlots. Some are designed for the farmer who logs only a few weeks of the year; some are logging accessories for use with a farm tractor. Other devices are for the commercial logger who harvests from farm woods most of the year.

1960. THE INTERRELATION AND COMPATABILITY OF SILVICULTURE AND LOGGING.
Pulp and Paper Mag. Canada 61 (8): 150-152, 159.
Explores the question: Are logging and good silviculture compatible? Cites the objectives of both the silviculturist and the logger, and the new methods and equipment for logging. Concludes that though compromise is often necessary, the methods and objectives of loggers and silviculturists are compatible, that if the tools and methods are provided to do a good silvicultural job, ways will be found to perpetuate stands rather than destroy them.

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1960. UP-GRADING THE PRODUCT OF HARDWOOD LUMBER OPERATIONS. I. LOGGING HARDWOODS MORE INTELLIGENTLY. So. Lumberman 200 (2498): 33, 34, 36, 40, illus.

On the premise that the low quality of much No. 3 Common and cull hardwood lumber on the market is man-made, not nature-made, the author tells ways to up-grade lumber by improving sawlog operations. Discusses felling and bucking, skidding and loading, and storage.

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1960. UP-GRADING THE PRODUCT OF HARDWOOD LUMBER OPERATIONS. II. HARDWOOD SAWMILLING PRACTICES THAT PAY. So. Lumberman 200 (2499): 31-34, 36, 48, illus.
Written to help mill owner recover and sell for high-grade uses the potentially high-grade material in the hardwoods he cuts, this article deals with reducing degrade in sawmilling, drying, and marketing operations. Figures show methods of sawing hardwood logs for best production and highest yield.

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1960. REVIVAL IN THE CHARCOAL INDUSTRY.
N. Y. Conservationist 14 (5): 10-12, illus.
Demand for charcoal for outdoor cookery has brought about a revival in the industry. Describes recent developments in charcoal manufacture, including new types of charcoal retorts. Tips on marketing, wood supply, and type of product.

1960. CONFERENCE ON MORE PROFITABLE USE OF MILL RESIDUES. INTRODUCTION.
Northeast. Logger 8 (8): 7, 30-32, illus.
Outlines need for developing more uses for sawmill "waste", including nearly 2 million cords of chippable coarse wood residues, 1¼ million tons of fine material, and about 2½ million tons of bark.

1960. ANCIENT LUMBER-PRODUCING AREA HAS NEW AUTOMATIC MILL.
Northeast. Logger 8 (10): 14-15, 37, illus.
Describes erection and operation of an ultramodern push-button Lavalley sawmill at Sanford, York County, Maine--within 18 miles of the site of the first sawmill erected in North America in 1634.

1960. THE REYNOLDS LUMBER COMPANY, WELLS, N. Y.
Northeast. Logger 8 (11): 24-25, illus.
Joe Reynolds, a 59-year-old woodsman just out of the hospital after a 4-year battle with a heart condition, borrowed $500 and built up a lumber company in the southern Adirondacks, which now operates two sawmills, a pallet plant, and two modern charcoal retorts.

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1960. THREE NEW CHARCOAL RETORTS.
FAO Forestry Equip. Notes E.24.60. 3 pp., illus. Rome.
Describes three new types of vertical charcoal retorts recently developed in the Northeast. These retorts are more efficient than other devices for manufacturing charcoal on a small scale, with a relatively low capital investment. In any of these retorts, charcoal can be produced at the rate of 1 ton for every 4 man-hours of labor.

Reviews

Bickford, C. Allen.

1960. Book review: GROWTH AND YIELDS OF NATURAL STANDS OF THE SOUTHERN PINES, by F. X. Schumacher and T. S. Coile; 115 pp., illus., 1960. Jour. Forestry 58: 406.

1960. Book review: EXPERIMENTAL DESIGN AND ANALYSIS IN FOREST RESEARCH, by J. N. R. Jeffers; 172 pp., illus., Stockholm, 1960. Jour. Forestry 58: 491-492.

Doolittle, Warren T.
1960. Book review: SOUTHERN FORESTRY SOILS, 8th Annual Forestry Symposium (1959), 132 pp., illus., La. State Univ. Press, Baton Rouge. Soil Sci. Soc. Amer. Proc. 24 (5): IV.

Lull, Howard W.
1960. Book review: FIRST NORTH AMERICAN FOREST SOILS CONFERENCE September 1958, Mich. State Univ. Agr. Expt. Sta., 266 pp., illus. and SOUTHERN FOREST SOILS: 8th ANNUAL FORESTRY SYMPOSIUM, Paul Y. Burns, ed., La. State Univ. Press, 132 pp., illus., 1960. Jour. Forestry 58: 653-654.

1960. Book review: HYDROLOGY, C. O. Wisler and E. F. Brater, John Wiley and Sons, 408 pp., illus., 1959. Jour. Forestry 58: 227-228.

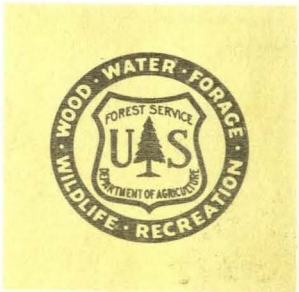
Marty, Robert.
1960. Book review: THE ROLE OF QUALITY IN THE EASTERN WHITE PINE INDUSTRY, by John Fedkiw, Neil J. Stout, and Frederick S. Hopkins; 20 pp., illus., N. Y. State Univ. Coll. Forestry, Syracuse, 1960. Jour. Forestry 58: 730.

McQuilkin, William E.
1960. Book review: SOUTHERN FORESTRY SOILS, 8th Annual Forestry Symposium (1959), 132 pp., illus. La. State Univ. Press, Baton Rouge. Forest Sci. 6: 364.

Sucoff, Edward I.
1960. Book review: MINERAL NUTRITION OF TREES, Duke Univ. School Forestry Bul. 15, 184 pp., illus., 1959. Jour. Forestry 58: 569.

Ware, Kenneth D.
1960. Book review: GROWTH AND YIELDS OF NATURAL STANDS OF THE SOUTHERN PINES, by F. X. Schumacher and T. S. Coile, 115 pp., illus. T. S. Coile, Inc., Durham, N.C. Forest Sci. 6: 368.

AGRICULTURE-FOREST SERVICE-UPPER DARBY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